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ABSTRACT

Part of a series of reports dealing with racial distribution in San Francisco schools, this memorandum presents 12 specific attendance alternatives and compares them according to effectiveness and cost. The evaluation of the alternatives is preceded by a summarization of the overall study. Then each of the 12 attendance patterns is defined and discussed. Some of the factors considered include the degree of racial balance or imbalance, school district boundaries, disadvantaged areas, feeder attendance rules, school reorganization, and busing. Summary sheets highlight the major features of each alternative. Maps showing assignment area boundaries are provided. Time-phased implementation of one pattern is investigated for feasibility. The implications of several alternatives for changes in transportation and facilities are examined. In addition, the effectiveness of alternative attendance patterns is compared with the corresponding costs of transportation and facility modifications. (EB)

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May 15, 1967

Research Memorandum No. 7

EVALUATION OF ALTERNATIVE ATTENDANCE PATTERNS TO IMPROVE RACIAL BALANCE

Prepared for:

SAN FRANCISCO UNIFIED SCHOOL DISTRICT

By: R. A. HARKER, HAZEL ELLIS, AND WILLIAM J. PLATT

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FOREWORD

In September 1966, the San Francisco Unified School District contracted with Stanford Research Institute to study alternative means by which racial imbalance in San Francisco's public schools might be diminished. The following Research Memorandum is one of a series in which the Institute is presenting its findings.

The overall objectives of the study provide that the Institute develop and evaluate several alternative patterns of pupil attendance that, if adopted, will result in the racial composition of individual schools more nearly reflecting the districtwide racial distribution.

This memorandum presents the alternative attendance patterns, together with summaries of several of the preceding analyses (i.e., measures of racial balance and transportation costs). The patterns are compared as to their relative effectiveness in achieving racial balance and as to cost of transportation and facility modifications. Time-phased implementation of one pattern is investigated for feasibility. (Supporting data are presented in Working Paper No. 2.)

No summary is necessary in this report since it and other memorandums in the series are summarized in Report No. 8.

The principal author of this Research Memorandum is Robert A. Harker. He was assisted by Hazel Ellis. William J. Platt, director of Manpower and Education Research and project leader for this study, also contributed to the analyses.

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INTRODUCTION

In preceding memorandums in this series, measures of racial balance were defined, enrollment was projected, the rationale for desegregation was described, educational organization for desegregation was discussed, the attitudes and suggestions of teachers were surveyed, and student transportation systems were analyzed. Now the current memorandum presents 12 specific attendance alternatives and compares them according to effectiveness and cost.

Before proceeding with the evaluation of alternatives, it is appropriate to summarize the steps in carrying out the study.

Steps in the Research Project

The San Francisco Board of Education authorized Stanford Research Institute to conduct a Phase I study in April 1966. This preliminary study was completed in July 1966. In it the research team interviewed community groups, developed preliminary concepts for alternative attendance patterns, and formulated work to be accomplished in completing the work in Phase II. Findings were contained in the Interim Report, Racial Balance in the San Francisco Unified School District--Phase I, published in July 1966.

Phase II was authorized in September 1966. In carrying out Phase II the Institute's research team worked closely with the District's Assistant Superintendents, responsible for the elementary, junior high, and senior divisions and for buildings and grounds. Several progress reports were given to the Board's Ad Hoc Committee on Ethnic Factors. When details of attendance patterns had been developed preliminarily, information on the implications for each school was made available to the four Assistant Superintendents for their review and suggestions. Several modifications in the alternatives were made in response to their comments.

As part of the survey of teachers reported in Research Memorandum No. 5, the research team gave progress report presentations of the study and invited comments from teachers. They made suggestions then and in more detail on the occasion of the 18 interviews held with groups of teachers and principals.

During Phase I and Phase II studies, the research team had many useful discussions with representatives of community groups interested in San Francisco's schools. The research team began reviewing preliminary findings with community groups in a presentation made February 22, 1967, at a conference organized by the Conference on Religion and Race and the Coordinating Council for Integrated Schools. Subsequently the Board of Education asked Stanford Research Institute to postpone further community reviews until the new Superintendent could participate. The contract was renegotiated to reflect this change.

The proposals contained in this report are sufficiently complex that a good deal of further review by the district staff and by the community seems appropriate in considering and implementing new attendance policies. This review can probably be accomplished best when the full set of findings is available in written form, as it now is. It is also of critical importance for the new Superintendent of Schools, Dr. Robert Jenkins, to participate in this review and to select those alternatives most compatible with the patterns of educational advance he is committed to administer.

Preliminary Computations

The study used several approximations to define the boundaries of racial balance--to determine the present degree of racial balance and the upper limit of complete balance. The first analysis* was conducted using a computerized transportation model and for which elementary school students were classified as white and nonwhite on the basis of the 1965 attendance records. Quotas were set for each school to give each racial representation that is exactly equal to the districtwide white student percentage of 42 percent. Assuming that all enrollments stay constant (only the racial mixes changed), the research team computed the white student quota for each school by multiplying its total enrollment by 42 percent. Then the white quota was subtracted from total enrollment to get the nonwhite quota. Four values were available: white population, nonwhite population, white quota, and nonwhite quota. A school's quota was filled from the population in the existing attendance zone, to the extent possible. For example, if the white quota for a school is 100 and the white population is 85, the 85 white students would be assigned

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* This analysis was undertaken early in the project before 1966 and 1971 attendance data was available. The later data would not alter conclusions reached on the basis of 1965 data.

to their home school and the remaining 15 white students would be sought from elsewhere. Thus the net white student requirement was computed for each school.

A computer program assigned surpluses of students to deficits in plant utilization to minimize total student-miles; i.e., optimal school-to-school flows were computed. The results of the analysis for the full equality case (i.e., all schools have the districtwide white and nonwhite student percentage) were:

Total students bused: 10,400 (about 25 percent of total enrollment)

Total student-miles: 34,400.

This reapportionment gave a preliminary biracial solution for cross-busing. For the second analysis, one-way busing of elementary school students was assumed, and only nonwhite students were transported. It was assumed that white student populations were fixed; i.e., white student quotas equal white student populations. Next, the number of nonwhite students needed to achieve full equality (42 percent white at each school) was computed. In the very segregated nonwhite schools this assumption produced a mass exodus of nonwhite students. The analysis disregarded school capacities. For example, if a school has 128 white students, then that school's total population is 128.0/0.42, or 305. The nonwhite quota is 177. Performing this calculation for each school and redistributing the surpluses to the deficits, the result is:

Total students bused: 17,000

Total student-miles: 40,500.

Each program was run on an incremental basis so that the number of students bused and the total student-miles could be associated with varying levels of integration.

The results of these two computer runs were insufficient for the SFUSD racial balance assignment in several respects. First, they dealt with a biracial division only, while the city has four major racial groups. Second, the procedures were discriminatory within any given school in that individual students would have to be selected for transportation on the basis of their race rather than on the basis of the geographical area in which they lived. Third, for the one-way busing case, school capacities were ignored. Fourth, the procedure did not account for the changing racial composition of the city.

Derived Criteria

On the basis of these considerations it was determined that the analyses should be conducted using the estimated 1971 population distribution by racial and ethnic group: white, Spanish surname, Oriental, and Negro. The year 1971 was selected as the earliest target date for full implementation of the alternative attendance patterns. Attendance areas and feeder systems would be so devised that the attendance boundaries would apply to all students within a specified geographic area; i.e.,attendance rules would be nondiscriminatory. School capacities would be observed to the extent possible, and the construction program resulting from the 1964 bond issue would be considered. These constraints were incorporated into the design of alternative attendance patterns.

Alternative Attendance Patterns Defined

An objective of the research program was to develop further and evaluate the five alternative pupil assignment patterns proposed in the Institute's Phase I report. It was assumed that any pupil assignment plan will be accompanied by education programs that will make it effective, and that compensatory education programs will be continued and strengthened. It was also assumed that specialized high schools, such as Lowell, Gompers, and O'Connell, will draw enrollment by admissions criteria appropriate to each and in a manner to ensure racial balance.

Ten variations of the basic five alternative patterns were designed in a preliminary manner and assessed for their effect on racial balance. The alternatives entailing the greatest impact on school operations were selected for review and comment by district personnel. Then the ten patterns were revised and two patterns were added. The final set of 12 alternative patterns to be evaluated in this report is defined in Table 27 bound at the back of this report. It is designed to be folded out for easy reference while this report is being read. Another way to differentiate the 12 alternatives is to describe changes from one to the next:

A-1 Adjust elementary boundaries only.

B-1 Adjust elementary boundaries and apply feeder attendance rules for junior and senior high schools. Bus certain junior and senior high school students.

B-2 Like B-1, but bus elementary students out of certain disadvantaged areas and assume that the academic senior high school becomes another comprehensive senior high school.

B-3 Like B-2, but assume that Lowell remains the academic senior high school.

C-1 Reorganize elementary schools into two types: K, 1-3 and K, 4-6. Otherwise like B-1.

C-2 Like C-1, but bus elementary students out of certain disadvantaged areas as in B-2. Assume that the academic senior high school becomes another comprehensive senior high school.

C-3 Like C-2, but Lowell remains the academic senior high school.

C-4 Like C-2, but assume that the academic senior high school is located at Benjamin Franklin school site.

C-5 Like C-4, but assume that Polytechnic Senior High School is closed.

D-1 Pair (Princeton Plan) elementary schools that have extremes of racial imbalance.

D-2 Like C-5, but pairing elementary schools having extremes of racial balance.

E-4 Reorganize grade structure to a 4-4-4 system. Apply feeder attendance rules. Assume academic senior high school is located at Benjamin Franklin site.

Discussions of these assignment patterns, summary sheets highlighting the major features of each alternative, and maps showing assignment area boundaries are given in the next chapter of this report. Detailed feeder patterns for each of the five major alternatives are given in Working Paper No. 2. A four-year transitional program is developed. The implications of the several alternatives for changes in transportation and facilities are examined. Finally, the cost-effectiveness of the several alternative attendance patterns is compared.

ALTERNATIVE SCHOOL ATTENDANCE PATTERNS

Twelve attendance patterns defined in the foregoing section and in Table 27 were devised and evaluated for the study. This chapter outlines the patterns and highlights their significant variations from the current school system and their effects on racial balance in the SFUSD.

General Guidelines

Specific guidelines were adopted to provide a consistent set of procedures for allocating students and the attendance boundaries for schools. They are:

1. Public school population estimates for 1971 by quadriracial grouping (white, Spanish, Negro, and Oriental) were used for attendance quantities.

2. The neighborhood concept was adhered to as much as possible, except for specific moves out of lower socioeconomic areas to accomplish racial balance.

3. Elementary school attendance boundaries were selected wherever possible to make no more than one mile of travel necessary for elementary students and no more than 1-1/2 miles for junior high and senior high school students.

4. School facilities and capacities for 1965 were assumed to be augmented by the implementation of the 1964 bond issue construction program. Every attempt was made to utilize schools within their allotted capacities; however, 10 percent overcapacity was allowed. (Present usage exceeds capacities by as much as 24 percent.)

5. Kindergarten (and preschool) students and school capacities were excluded from the computations, as all elementary schools were assumed to offer kindergarten classes.

6. Natural geographic boundaries (highways, topography, and so forth) were followed in setting attendance area boundaries.

7. Newer schools and those with more extensive facilities were used as receiving schools. Older schools in lower socioeconomic neighborhoods were underpopulated or closed where possible.

8. All busing (except for the pairing plans) was one-way and entailed movement from lower to higher socioeconomic areas.

9. When students were bused, the number of students received in a school is few enough to leave a significant (over 40 percent) percentage of enrollment for the neighborhood students.

10. Major movements of ethnic groups were accomplished primarily to balance the white and Negro races. Spanish and Oriental desegregation were secondary considerations.

In practice, variations in areas of the city and in school facilities were sufficient to make it necessary to compromise among the guidelines for individual attendance patterns. These compromises were made to minimize the total variation from the rules. The major deviations are pointed out in the following descriptions of individual attendance patterns.

Attendance Patterns, 1966

The 1966 San Francisco school system is presented so that the proposed alternatives can be compared with it. Throughout the chapter are maps of the alternative attendance patterns, each facing its description sheet. School names are included in the map in Figure 1 only.

A major difference between the 1966 school system and the alternative attendance patterns are that the proposed plans (with the exception of A-1 and D-1) follow a feeder system, and all the alternatives represent improved racial balance (see Research Memorandum No. 4). Only at the elementary level in the B-1 pattern has the racial balance index dropped by several points. This drop is accounted for by the fact that no elementary school children are bused in the B-1 pattern, whereas about 1,600 elementary school children were bused in 1966.

With reference to capacity, both Luther Burbank and Portola Junior High Schools were more than 10 percent over capacity in 1966, and half of the high schools were more than 10 percent over capacity, i.e., Galileo, George Washington, Lowell, and Mission.

ACTUAL 1966 ATTENDANCE PATTERNS

ORGANIZATION: 6-3-3

RACIAL BALANCE INDEX: Base 100

Elementary:	100.0
Junior High:	100.0
Senior High:	100.0

ATTENDANCE PATTERN: Neighborhood schools, except some impacted and overcrowded areas. Partial feeder system.

TRANSPORTATION (Number of Students):

Elementary:	1,620
Junior High:	140
Senior High:	None

OVERCAPACITY (Number of Schools):

Elementary:	2
Junior High:	2
Senior High:	4

NUMBER OF SCHOOLS CLOSED: None

NUMBER OF NEW SCHOOLS REQUIRED: None

ACADEMIC SENIOR HIGH SCHOOL: Lowell

Figure 1

1966 ATTENDANCE PATTERN

Alternative A-1 (Redistricting)

Redistricting of adjacent schools, each heavily imbalanced (one primarily white, the other nonwhite) was attempted in alternative A-1, but with unimpressive results. Few such pairs of neighboring schools with complementary racial imbalances exist.

Schools of greater than 65 percent nonwhite enrollment were selected if they were adjacent to a predominantly white school. Census tract blocks of potential value were selected for transfer between adjacent schools. The 1-mile-distance-to-school constraint was observed. A computer program was developed to accomplish the exchange of blocks, and the new enrollments were revealed. The schools included in the redistricting of elementary schools are listed in Table 1 and shown in the map in Figure 2. Details are given in Working Paper No. 2.

Examination of several attempts demonstrated that relatively little improvement is possible with this technique. Improvement over 1966 changed no more than 10 percent between individual schools, and the effect on the racial balance for the total city was less than 6 percent. Inspection of 1971 data reveals that many of these individual improvements will quickly be nullified by the spread of nonwhite population areas. Further analysis is not likely to produce greater benefits with this technique.

Table 1

SCHOOLS REDISTRICTED

Group 1	Group 4
Emerson	Longfellow
Grant	Commodore Sloat
Yerba Buena	Farragut
	San Miguel
Group 2	Sheridan
Hawthorne	Sunnyside
Edison	
	Group 5
Group 3	Bayview
	Bret Harte
Patrick Henry	Candlestick Cove
Daniel Webster	E. R. Taylor
	Junipero Serra
	Paul Revere

ALTERNATIVE A-1

ORGANIZATION: 6-3-3

RACIAL BALANCE INDEX: Base 100, 1965 enrollment data

Elementary: 105.9 (white-nonwhite only)
Junior High: --
Senior High: --

ATTENDANCE PATTERN: Neighborhood schools

TRANSPORTATION (Number of Students):

Elementary: None
Junior High: --
Senior High: None

OVERCAPACITY (Number of Schools):

Elementary: 4
Junior High: --
Senior High: --

NUMBER OF SCHOOLS CLOSED: None

NUMBER OF NEW SCHOOLS REQUIRED: None

ACADEMIC SENIOR HIGH SCHOOL: --

Figure 2

ALTERNATIVE A - 1
ATTENDANCE PATTERN

Alternatives B (6-3-3 and Feeder)

The B plans are based on the 6-3-3 system presently used by the SFUSD. Attendance boundaries have been changed, however, and a complete feeder system is used.

Figure 3 is a map of the B-1 pattern, shown opposite its detailed description. The feeder pattern is presented in Working Paper No. 2. There is no busing at the elementary school level; but about 500 students from the Hunters Point area attend A. P. Giannini and Aptos Junior High Schools, continuing into Lincoln High School. Also, graduates of Pelton and Francisco attend Lincoln and Diamond Heights Senior High Schools. A total of 2,120 secondary students are bused.

Two senior high schools--Lincoln and Mission--are more than 10 percent over capacity in this plan. Polytechnic, which has a rated capacity of 2,200, is not used to capacity: its anticipated enrollment is about 1,600 students in 1971. It is fed by Herbert Hoover Junior High School, and would be a predominantly white school.

For B-1 the racial balance measure for elementary schools decreases by nearly 7 points compared with 1966 because 1,600 fewer elementary students would be transported than in 1966. A significant improvement in racial balance at junior and senior high school levels produces a small overall improvement.

The B-2 and B-3 patterns are almost identical to the B-1 pattern except that there is one-way busing for certain students in elementary school. These details are shown in the B-3 feeder pattern in Working Paper No. 2. To summarize these proposals: Hunters Point I and II, Hunters Point Annex, Sir Francis Drake Annex, and John Swett are closed. Jed Smith is used only for kindergarten and the Head Start program. The elementary school children who would have attended these schools are sent to schools in the Sunset, Marina, and Chinatown areas. Also, some students from John Muir attend schools in the Richmond District and some Ortega students attend West Portal. In net, about 2,000 elementary school children are bused out of low socioeconomic areas in these plans, compared with 1,600 at this level who were being bused by the school district in 1966. Only two elementary schools are overcrowded. The added one-way busing at elementary school level increases the elementary racial balance in the B-2 and B-3 plans to 113.7.

The major difference between the B-2 and B-3 plans is that in B-2 all senior high schools, including Lowell, are considered as comprehensive.

ALTERNATIVE B-1

ORGANIZATION: 6-3-3

RACIAL BALANCE INDEX: Base 100

Elementary:	93.3
Junior High:	111.1
Senior High:	110.0

ATTENDANCE PATTERN: Neighborhood schools and complete feeder system

TRANSPORTATION (Number of Students):

Elementary:	None
Junior High:	725
Senior High:	2,120

OVERCAPACITY (Number of Schools):

Elementary:	2
Junior High:	None
Senior High:	2

NUMBER OF SCHOOLS CLOSED: 2

NUMBER OF NEW SCHOOLS REQUIRED: None

ACADEMIC SENIOR HIGH SCHOOL: Lowell

Figure 3

ALTERNATIVE B - 1
ATTENDANCE PATTERN

ALTERNATIVE B-3

ORGANIZATION: 6-3-3

RACIAL BALANCE INDEX: Base 100

Elementary:	113.7
Junior High:	122.5
Senior High:	113.0

ATTENDANCE PATTERN: Neighborhood schools and complete feeder system

TRANSPORTATION (Number of Students):

Elementary:	2,270
Junior High:	1,170
Senior High:	2,670

OVERCAPACITY (Number of Schools):

Elementary:	3
Junior High:	None
Senior High:	2

NUMBER OF SCHOOLS CLOSED: 8

NUMBER OF NEW SCHOOLS REQUIRED: None

ACADEMIC SENIOR HIGH SCHOOL: Lowell

Graduates of Horace Mann and Aptos Junior High Schools then attend Lowell. This plan has the advantage of not overloading Mission and Lincoln Senior High Schools, which occurs in both the B-1 and B-3 plans. Racial balance at senior high school levels measures 114.2 for B-2 compared with 113.0 for B-3. The junior high school measures are 119.9 and 122.5, respectively.

Alternatives C-1 Through 4 (3-3-3-3 and Feeder)

The C-1 through C-4 plans are basically similar to the B plans. However, in C patterns elementary schools are of two types: grades 1-3 and grades 4-6. These schools are generally paired, although two small 1-3 schools may feed one larger 4-6 school. This system increases racial balance at the elementary level by establishing larger attendance areas. Average distances to school are, therefore, increased. Boundaries for the C-3 pattern are shown in Figure 4. The feeder system details are in Working Paper No. 2.

The major differences among the C patterns are:

C-1 Only 600 elementary school children are bused; this busing is at the 4-6 level out of the Hunters Point area.

C-2,3,4 About 2,700 elementary school children are bused out of low socioeconomic areas at the 1-3 level as well as at the 4-6 level. The same general busing patterns apply as in the B plans.

In the C-1 and C-2 plans, all senior high schools are comprehensive. The C-3 plan uses Lowell as an academic senior high school. C-4 expands Benjamin Franklin to twice its present size (through new construction), and it, instead of Lowell, is used as the academic senior high school. This plan has the advantage of breaking up the relatively impacted Fillmore district at the junior high school level and sending these students to Everett, Francisco, Marina, and Roosevelt. Also, the new location of the academic school, designed to serve districtwide enrollment, would be more central than that of the present Lowell.

Present elementary school capacity varies from 195 to 1,185 students. Whereas most of the schools vary between 400 and 800, the variations in capacity cause overloading in more schools than in schools of the B patterns. However, most of the elementary schools which were assigned an enrollment greater than present capacity can accommodate the extra students through the use of bungalows. The exception is Mark Twain in the C-2, 3, and 4 patterns, which would require new capacity.

As is true of the B patterns, when Lowell is used as an academic senior high school, Mission and Lincoln Senior High Schools are overcrowded.

ALTERNATIVE C-3

ORGANIZATION: 3-3-3-3

RACIAL BALANCE INDEX: Base 100

Elementary:	124.7
Junior High:	122.5
Senior High:	113.0

ATTENDANCE PATTERN: Neighborhood schools, except impacted areas

TRANSPORTATION (Number of Students):

Elementary:	2,770
Junior High:	1,160
Senior High:	2,480

OVERCAPACITY (Number of Schools):

Elementary:	13
Junior High:	None
Senior High:	2

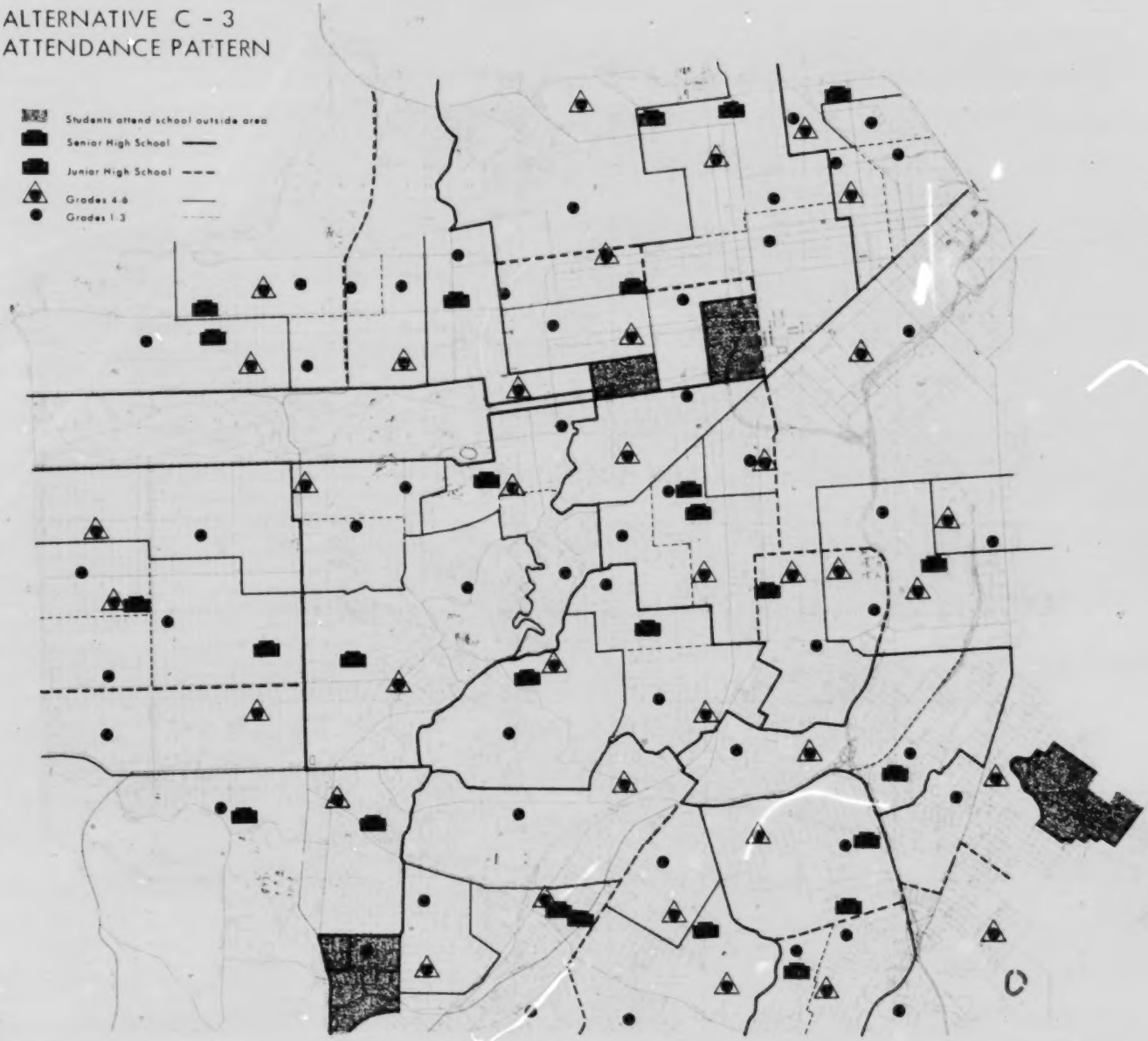
NUMBER OF SCHOOLS CLOSED: 7

NUMBER OF NEW SCHOOLS REQUIRED: None

ACADEMIC SENIOR HIGH SCHOOL: Lowell

Figure 4

ALTERNATIVE C - 3
ATTENDANCE PATTERN



The racial balance measures for the C-1 through C-4 plans are:

Pattern	Elementary	Junior High	Senior High
C-1	103.5	111.1	110.0
C-2	124.7	119.9	114.2
C-3	124.7	122.5	113.0
C-4	124.7	128.4	114.0

The newly established boundaries for junior high school attendance areas in the Fillmore District under the C-4 plan are similar to C-5 and are shown in Figure 4.

Alternative C-5 (3-3-3-3 and Feeder; Polytechnic Senior High School Closed)

Alternative C-5 was developed after district and community review of the earlier alternatives. It extends the concepts developed in alternative C-4. Further, it modifies the attendance boundaries at all school levels. The two most important differences between C-4 and C-5 alternatives are phasing out Polytechnic Senior High School and combining the administrations of Horace Mann Junior High School and John O'Connell Trade and Industrial School for the C-5 pattern. Figure 5 shows the map for the C-5 pattern; the feeder pattern is presented in Working Paper No. 2.

The C-5 plan requires expansion of the Mark Twain Elementary and A. P. Giannini Junior High School facilities in the Sunset District. This alternative also contemplates a new small elementary school (10 classrooms) at the 38th Avenue and Ulloa Street site owned by the district.

There is significant excess capacity at all school levels in the Chinatown area to allow for the possible underestimate of future immigrant population as follows:

School	Excess Capacity (number of students)
Galileo J.H.S.	230
Francisco J.H.S.	640
Garfield	170
Sarah B. Cooper	110
Commodore Stockton	480
Jean Parker	240
Washington Irving	150

This plan entails more extensive busing than in any of the plans discussed thus far, although it restricts itself to one-way busing only (from the lower socioeconomic areas to higher). This plan also phases out the least adequate senior high school in the city and the only one without adequate athletic facilites.

Detailed discussion of the school facilities, transportation, and time phasing for the C-5 plan are presented in later chapters.

ALTERNATIVE C-5

ORGANIZATION: 3-3-3-3

RACIAL BALANCE INDEX: Base 100

Elementary: 116.0
Junior High: 133.6
Senior High: 116.8

ATTENDANCE PATTERN: Neighborhood schools, except some impacted areas

TRANSPORTATION (Number of Students):

Elementary: 2,800
Junior High: 2,990
Senior High: 3,440

OVERCAPACITY (Number of Schools):

Elementary: 16
Junior High: 1
Senior High: None

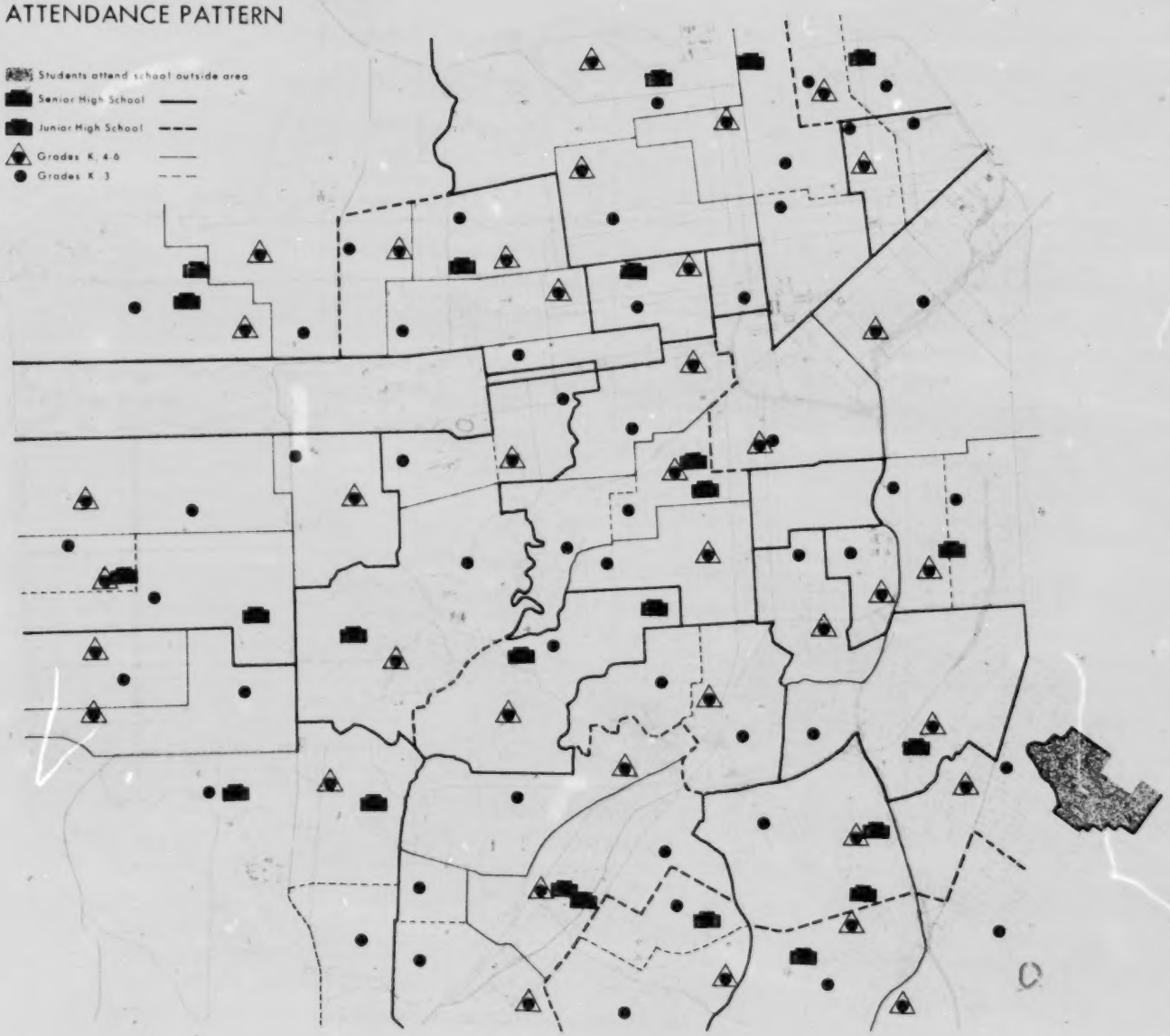
NUMBER OF SCHOOLS CLOSED: 8

NUMBER OF NEW SCHOOLS REQUIRED: 1

ACADEMIC SENIOR HIGH SCHOOL: Benjamin Franklin

Figure 5

ALTERNATIVE C - 5
ATTENDANCE PATTERN



Alternatives D (3-3-3-3 and Feeder with Cross-Busing)

In the D-1 alternative each elementary school that has an enrollment of 70 percent or more of white or nonwhite was selected as a candidate for pairing with a school of complementary imbalance. The pairing was accomplished by using one school for grades 1-3 for students from both neighborhoods, and assigning all 4-6 students from both neighborhoods to the companion school.

In 1965, there were 24 nonwhite schools and 22 white schools by a 70-percent criterion. In selecting the pairings, the most extremely imbalanced schools were chosen first and the remaining were paired, generally in inverse order of imbalance. Capacities were respected and modifications in pairings were made by capacity constraints when required.

At the conclusion of each computer run (there were four), new school populations were calculated, together with the racial balance measures for the entire district. The impact of the final set of 19 pairings on the level of racial balance for the city is shown in Figure 6, opposite a description of alternative D-1.

The D-2 plan uses the C-5 plan as its basis, but employs cross-busing to achieve greater racial balance than is achieved on any of the other 1971 patterns. Busing, while not reaching the proportions of the D-1 pattern, does affect almost 7,000 elementary school children, who then continue into the respective junior and senior high schools in the receiving areas. Total busing under the D-2 alternative affects about 15,000 students.

The D-2 racial balance measure is 145.1 for elementary schools, 147.7 for junior high schools, and 130.5 for high schools. These values are from 15 to 55 points higher than for the other alternatives that use one-way busing only. The significant improvement is due largely to cross-busing Negro and Oriental students.

The list of paired schools for the D-1 pattern and the feeder pattern for D-2 are presented in Working Paper No. 2.

ALTERNATIVE D-1

ORGANIZATION: 3-3-3-3

RACIAL BALANCE INDEX: Base 100, 1965 enrollment data

Elementary: 160.2 (white-nonwhite only)
Junior High: --
Senior High: --

ATTENDANCE PATTERN: Neighborhood pattern, except pairing extremes

TRANSPORTATION (Number of Students):

Elementary: 8,750
Junior High: --
Senior High: --

OVERCAPACITY (Number of Schools):

Elementary: 3
Junior High: --
Senior High: --

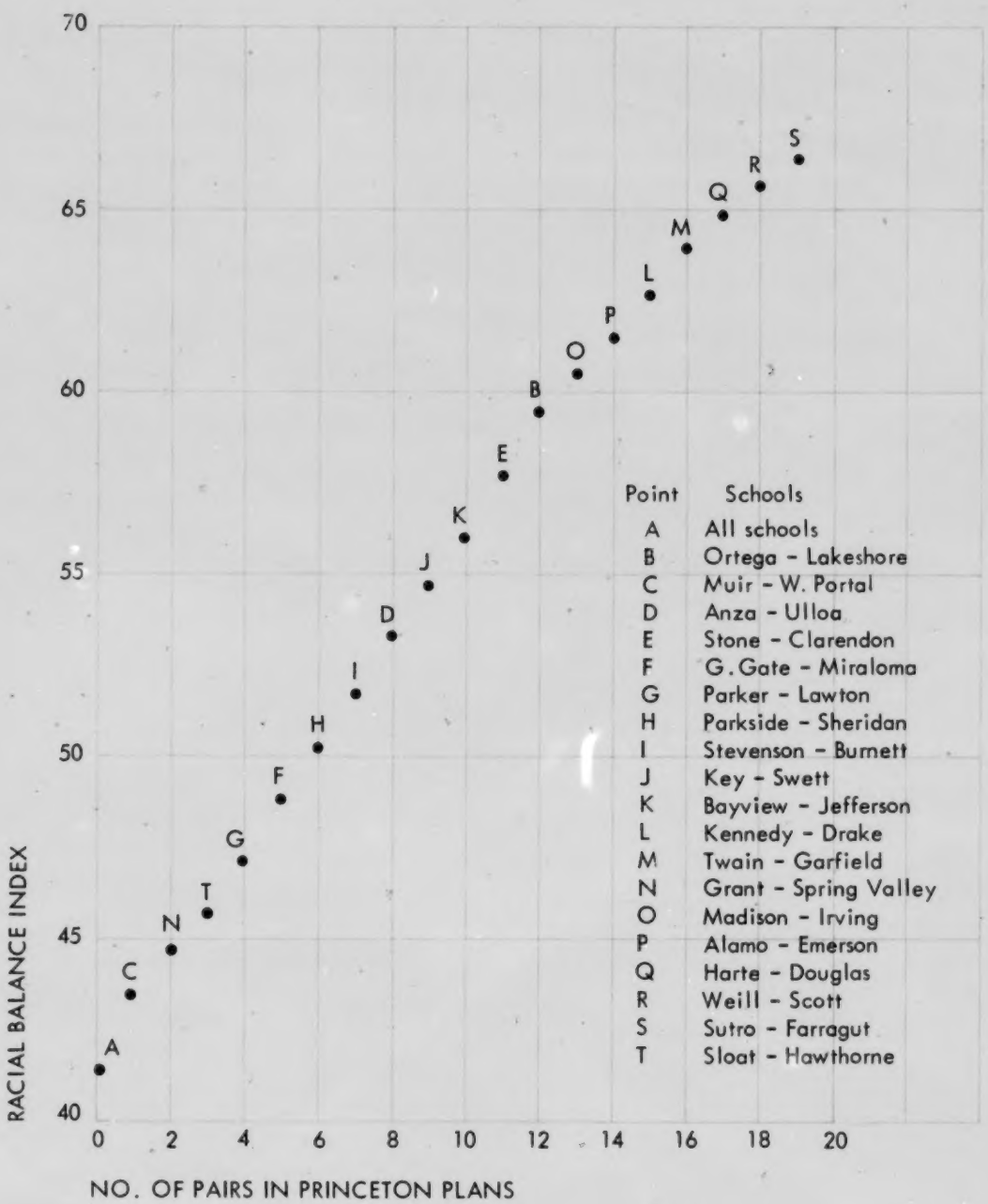
NUMBER OF SCHOOLS CLOSED: None

NUMBER OF NEW SCHOOLS REQUIRED: None

ACADEMIC SENIOR HIGH SCHOOL: --

Figure 6

ALTERNATIVE D - 1
ATTENDANCE PATTERNS



ALTERNATIVE D-2

ORGANIZATION: 3-3-3-3

RACIAL BALANCE INDEX: Base 100

Elementary:	145.1
Junior High:	147.7
Senior High:	130.5

ATTENDANCE PATTERN: Neighborhood pattern, except some impacted areas and some pairing

TRANSPORTATION (Number of Students):

Elementary:	6,925
Junior High:	4,220
Senior High:	4,220

OVERCAPACITY (Number of Schools):

Elementary:	12
Junior High:	2
Senior High:	None

NUMBER OF SCHOOLS CLOSED: 8

NUMBER OF NEW SCHOOLS REQUIRED: 1

ACADEMIC SENIOR HIGH SCHOOL: Benjamin Franklin

Alternative E-4 (4-4-4)

This plan is based on the 4-4-4 system, which is now being adopted in New York City and in several other cities. As this plan employs 4-year high schools and 4-year middle schools, it requires the most extensive changes in the San Francisco school plant. To achieve the added capacity at the upper two levels, school plants that are adjacent or close to each other have been combined to form what might be called educational parks.

High School Parks	Middle School Parks
Balboa/Denman	Giannini/Mark Twain
George Washington/Presidio	Luther Burbank/John McLaren
Lowell/Lakeshore	Portola/E. R. Taylor
Mission/Everett	

The use of Benjamin Franklin as an academic high school would require construction to house an additional 1,700 students, and a new middle school of 2,000 capacity is called for in the Richmond District. Since many existing junior high school buildings are used to augment the capacity needed at the high school level, four middle schools--Herbert Hoover, Horace Mann, and the new Potrero and Visitacion Valley schools--become more than 10 percent over capacity in E-4. Some of the larger elementary schools also help make up the shortage at the middle school level. Many schools would require extensive modifications for use as middle schools, including added or expanded cafeterias, libraries, science laboratories, homemaking, industrial arts, and physical education facilities. These schools are:

Cabrillo	Parkside
Clarendon	San Miguel
Diamond Heights Elementary	Sanchez
McKinley	Sherman
Marshall Annex	

Major student movements include busing some 1,000 elementary school children from the Hunters Point area to the Sunset District. At the middle level, Pelton is fed into Abraham Lincoln, Francisco to Diamond Heights, Horace Mann to Lowell, and Visitacion Valley to Mission. Because of the large capacity created in some of the high school complexes, distances to school are perforce increased in this plan.

Because elementary schools in this plan are used only for kindergarten plus the first four grades, a considerable excess capacity is created at this level. As a result, more elementary schools are phased out in this plan than in any other.

The map for the E-4 pattern follows in Figure 7, opposite its detailed description.

ALTERNATIVE E-4

ORGANIZATION: 4-4-4

RACIAL BALANCE INDEX: Base 100

Elementary: 106.2
Middle School: 114.9
High School: 114.8

ATTENDANCE PATTERN: Neighborhood schools, except some impacted areas

TRANSPORTATION (Number of Students):

Elementary: 1,020
Middle School: 760
High School: 4,710

OVERCAPACITY (Number of Schools):

Elementary: None
Middle School: 4
High School: None

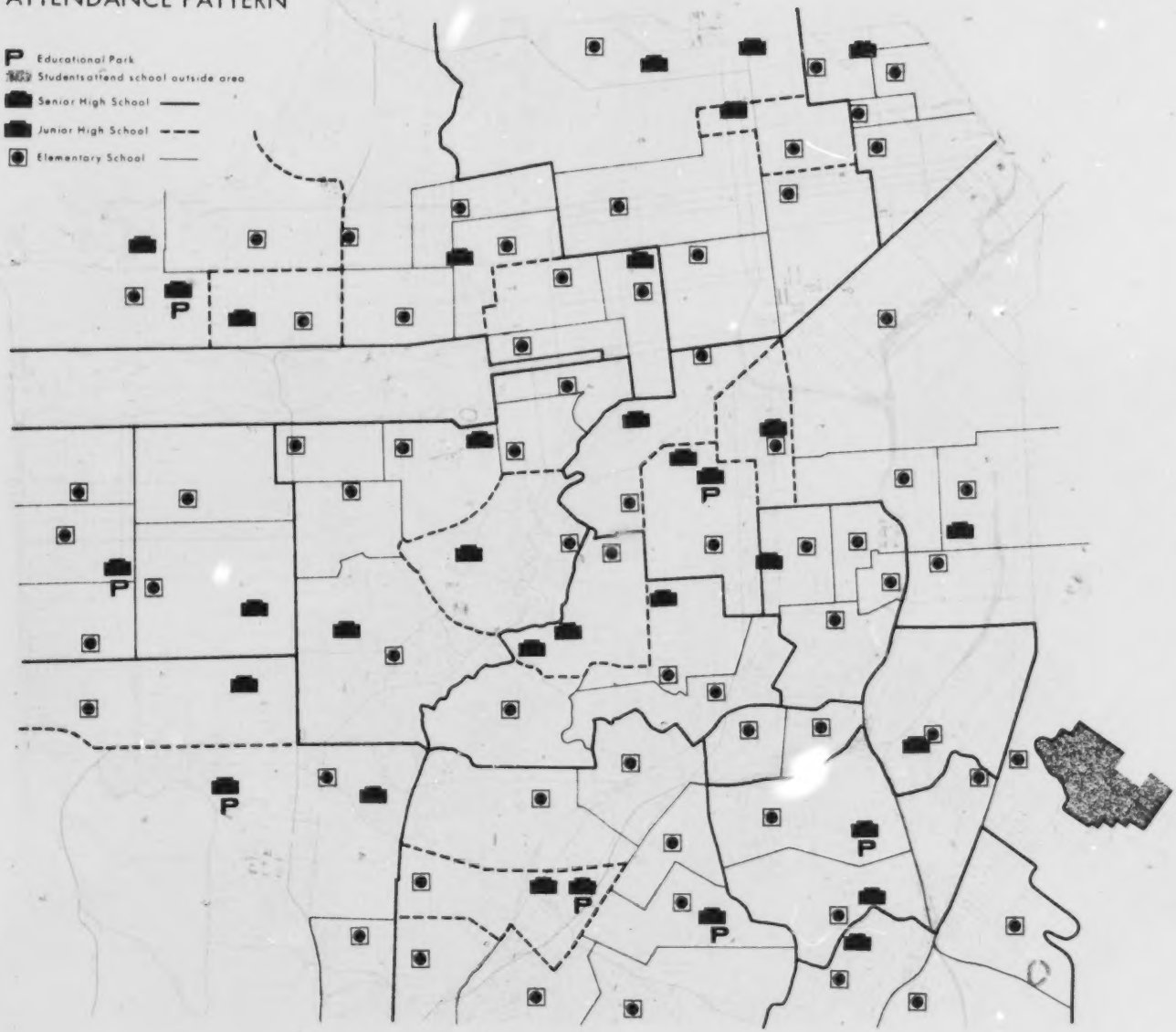
NUMBER OF SCHOOLS CLOSED: 16

NUMBER OF NEW SCHOOLS REQUIRED: 1

ACADEMIC HIGH SCHOOL: Benjamin Franklin

Figure 7

ALTERNATIVE E - 4
ATTENDANCE PATTERN



RACIAL BALANCE MEASURES

Definition

A racial balance index was derived to measure the degree of integration in the San Francisco school system. This measure is described in detail in Research Memorandum No. 1. Racial balance refers to the way in which white, Spanish, Negro, and Oriental students are distributed among the schools. Key elements in defining racial balance are the quadriracial composition of San Francisco and the use of the school as the unit of aggregation. The racial balance scale is so constructed that if every school had exactly the districtwide racial mixture of students, a value of 100 would result. If every school housed only one race (full segregation), a value of zero would result. Intermediate values reflect the degree to which the racial composition at each school varies from the districtwide average composition. The measure takes school size into account.

Table 2 compares several measures of racial balance for the 1966 enrollment and for the 1971 C-5 case. While the direction of the changes is the same, the absolute and relative changes differ markedly, reflecting the different scales used.

In reporting the school assignment alternatives in the feeder patterns (Working Paper No. 2), the schools were classified as white, Spanish, Negro, Oriental, or mixed. Each school was classified on a basis of 50 percent or more of one race; for examples, if a school had more than 50 percent white students, it was classified white; if the school had more than 50 percent Negro students, it was classified Negro. The mixed category describes a school with fewer than 50 percent of any single race.

Another racial balance measure used as the basis enrollment in schools with between 25 and 50 percent white students (roughly equivalent to ±30 percent of the districtwide average percent white). This measure emphasizes the white-nonwhite mix of students, indicating the exposure of nonwhite students to those in the country's majority ethnic group.

Table 2

COMPARISON OF RACIAL BALANCE MEASURES*

Measure	Elementary		Junior High		Senior High	
	1966	C-5	1966	C-5	1966	C-5
Index (quadriracial)	40.1	46.5	50.3	67.2	60.0	70.0
Mixed schools†	17.6	41.0	33.1	48.5	45.7	81.3
Schools 25-50% white†	23.5	43.2	42.0	75.0	45.0	81.3
Schools 80% or more one race†	27.6	20.8	23.1	0	14.2	0
Index (Base 100) quadri-racial	100.0	116.0	100.0	133.5	100.0	116.8
Index (Base 100) white-nonwhite	100.0	127.6	100.0	144.5	100.0	127.6
Index (Base 100) negro-non-negro	100.0	131.4	100.0	150.2	100.0	117.0

* See text for definition.

† Percentages of district students in defined schools.

Still another racial balance index measured the percentage of students in schools having 80 percent or more of a single race. This measure is useful in analysis of schools with extreme racial imbalance (or segregation).

A final index measures the district's relative improvement in racial balance from 1966 to 1971. In this index, the quadratic racial balance index for 1966 was set equal to 100. The values derived for other plans were compared with this base by computing the improvement over 1966. For example, the 1971 C-5 elementary school value of 47.43 is divided by the 1966 value of 40.96 to give a relative value of 115.8 or a relative improvement of 15.8 percent. This index was selected as the most appropriate for this study because it meets the research objective of evaluating the improvement in racial balance. It is the measure used henceforth in this report.

These measures of racial balance are subjective in the sense that the varying scales reflect implicit assumptions as to the values of

varying mixes of students in the individual schools and in the system as a whole. For example, the indexes for Spanish-non-Spanish and for Negro-non-Negro are weighted proportionately to the percentages of Spanish and Negro students in total student population. To show the actual distributions, Table 3 presents the percentages of students by race in the senior high schools for 1966, and for the C-5 and D-2 patterns in 1971. These distributions yield quadratic racial balance index values of about 60, 70, and 80, respectively, and to base 100 values of approximately 100, 117, and 131.

Racial Balance--Comparison of Alternative Attendance Patterns

Racial balance was measured for each of the 12 alternative attendance patterns, as well as for the actual 1966 attendance patterns. The base 100 racial balance measure was computed for each of the four races and for the quadriracial distributions at elementary, junior high, and senior high school levels.

Table 4 presents the quadriracial and Negro-non-Negro indexes for each of the attendance patterns analyzed for the elementary, junior high, and senior high schools. Relative effectiveness increases as modifications to the present school system become more comprehensive. The cost-effectiveness relationship is shown in the last chapter of this report.

Table 5 shows the racial balance measures, by race, for the actual 1966, the C-5, and D-2 attendance patterns. As noted in the guidelines, initial emphasis was given to increasing racial balance of the white and Negro races, and secondary emphasis was given to Spanish and Oriental students. The effects can be seen by comparing the changes between the 1966 and the C-5 measures. Relatively great improvement for white and Negro students is shown at all school levels, particularly at secondary school level.

The relatively low racial balance scores achieved for elementary schools for the 1966 and the C-5 patterns mirror the residential segregation in San Francisco and the neighborhood character of most of these schools. Further, the index is so constructed that a few extremely imbalanced schools degrade the score, a situation found only at the elementary level.

The C-5 attendance pattern achieves a relatively high degree of racial balance for white and Negro students at all levels and for all

Table 3

COMPARISON OF RACIAL DISTRIBUTION IN SFUSD HIGH SCHOOLS
(Percent of Students)

	1966 Busing				C-5				D-2			
	White	Spanish	Negro	Oriental	White	Spanish	Negro	Oriental	White	Spanish	Negro	Oriental
Abraham Lincoln	82%	3%	8%	6%	63%	1%	23%	14%	63%	1%	23%	14%
Balboa	58	15	23	4	46	16	30	8	46	16	30	8
Galileo	20	4	11	66	19	7	7	68	24	9	30	36
George Washington	47	4	19	30	36	3	19	42	36	3	19	42
Lowell	62	3	4	32	45	10	40	5	46	10	40	5
Mission	39	31	23	8	37	20	33	9	33	17	21	29
Polytechnic	31	10	51	8	--	--	--	--	--	--	--	--
Woodrow Wilson	41	11	41	7	36	10	49	6	29	8	28	35
Diamond Heights	--	--	--	--	37	3	29	30	41	4	37	19
Benjamin Franklin	--	--	--	--	40	9	28	24	40	9	28	24
Total high schools	49	10	20	22	40	9	28	23	40	9	28	23

Table 4

RACIAL BALANCE MEASURES OF ALTERNATIVE ATTENDANCE PATTERNS
(Base 100)

Attendance Pattern	Elementary		Junior High		Senior High	
	Quadriracial	Negro-Non-Negro	Quadriracial	Negro-Non-Negro	Quadriracial	Negro-Non-Negro
1966	100.0	100.0	100.0	100.0	100.0	100.0
A-1	105.9*	--	--	--	--	--
B-1	93.3	85.6	111.1	118.0	110.0	106.0
B-2	113.7	129.9	119.9	142.3	114.2	118.6
B-3	113.7	129.9	122.5	146.9	113.0	114.3
C-1	103.5	102.9	111.1	118.0	110.0	106.0
C-2	124.7	149.1	119.9	142.3	114.2	118.6
C-3	124.7	149.1	122.5	146.9	113.0	114.3
C-4	124.7	149.1	128.4	152.9	114.0	114.5
C-5	116.0	131.4	133.6	150.2	116.8	117.0
D-1	160.2*	--	--	--	--	--
D-2	145.1	189.8	147.7	171.0	130.5	131.0
E-4	105.2	112.6	114.9	128.1	114.8	117.4

* White-nonwhite only.

races except the Oriental at secondary school levels. Little change is proposed for Spanish student attendance.

Table 5

RACIAL BALANCE MEASURES, BY RACE
(Base 100)

	White	Spanish	Negro	Oriental	Total
Elementary					
1966	100.0	100.0	100.0	100.0	100.0
C-5	127.9	104.1	131.4	101.5	116.0
D-2	136.0	104.1	189.8	151.4	145.1
Junior high					
1966	100.0	100.0	100.0	100.0	100.0
C-5	144.5	114.8	150.2	121.3	133.6
D-2	143.9	114.7	171.0	154.5	147.7
Senior high					
1966	100.0	100.0	100.0	100.0	100.0
C-5	127.6	114.3	117.0	109.6	116.8
D-2	129.1	116.6	131.0	141.8	130.5

Table 6 lists the schools that have 80 percent or more enrollment of any of the four races. The percentages for 1966 and the C-5 and D-2 patterns are also shown. Only Lakeshore Elementary School has over 80 percent white enrollment. The low degree of racial balance achieved for Negro and Oriental students is influenced by the increasing concentration of these races in local areas. Four schools become over 80 percent Negro and four schools become Oriental between 1966 and 1971, despite attempts under the C-5 analysis to improve racial balance. Table 7 shows the number of schools with over 80 percent attendance of one race, by alternative and by race.

The D-2 pattern has major impact on the racial balance of predominately Negro and Oriental schools. This plan employs cross-busing of Negro and Oriental students, particularly between the southeast section

Table 6

RACIALLY IMBALANCED SCHOOLS
(80 Percent or Over)

School	Race	Percent Single Race 1966	C-5	D-2
Elementary				
A. Jackson	N	72%	93%	93%
Anza	N	91	48	48
Bay View	N	85	95	51
Bret Harte	N	85	86	45
Burnett	N	91	96	52
Candlestick Cove	N	38	86	42
Clarendon	W	87	79	32
Commodore Stockton	O	95	90	52
D. Stone	N	77	95	95
Emerson	N	89	24	24
Farragut	N	71	85	85
Garfield	O	87	85	35
Golden Gate	N	95	91	62
Hancock	O	52	85	52
Hunters Point I	N	98	--	--
Hunters Point II	N	95	--	--
Jean Parker	O	94	90	38
J. Smith	N	92	--	--
John Muir	N	87	96	64
John Swett	N	86	74	38
Lakeshore	W	80	82	82
Lawton	W	85	46	46
Longfellow	N	10	85	85
McKinley	N	54	97	38
Ortega	N	92	100	100
Parkside	W	80	46	46
P. A. Hearst	W	80	45	45
R. Weill	N	73	91	49
S. B. Cooper	O	54	85	43
Sheridan	N	90	85	85
Sherman	O	37	83	28
S. F. Drake	N	96	--	--
S. F. Drake Annex	N	96	--	--
Spring Valley	O	94	85	55
Ulloa	W	85	46	46
Washington Irving	O	72	90	43
West Portal	W	86	79	49
Junior high school				
A. P. Giannini	W	81	54	54
B. Franklin	N	88	--	--
Pelton	N	86	38	38
Senior high school				
A. Lincoln	W	82	63	63

of the city and Chinatown. This pattern eliminates the heavy concentrations of the Orientals, and reduces to six the schools with heavy concentrations of Negro students.

Table 7

SCHOOLS WITH OVER 80 PERCENT OF ONE RACE

Race	Number of Schools		
	1966	C-5*	D-2
White	9	1	1
Spanish	0	0	0
Negro	17	14	6
Oriental	4	8	0
Total	30	23	7

* Four Negro and four Oriental schools become over 80 percent single race between 1966 and 1971.

While cross-busing under the D-2 pattern significantly improves the racial balance index for Negro and Oriental measures, it has little effect on Negro-white integration. Therefore, unless the district wants to cross-bus Negroes and Orientals, cross-bus white students into lower socioeconomic neighborhoods, and radically modify school facilities, it appears that the level of racial balance attainable in the C-2, C-3, C-4, or C-5 patterns is about as much as can be realized.

TIME PHASING FOR IMPLEMENTATION

Alternative attendance patterns have been planned for 1971, the nearest year in which added capacity authorized by the 1964 bond issue will be in place. Many adjustments, foreseen and unforeseen, within the school system and in its relations with the community, will be necessary. Adjustments will demand administrative time if they are to be handled properly. To try to handle them all in one year would be to saturate administrative capacity and probably result in a degradation of educational effectiveness. Accordingly, some sort of multiyear phasing-in seems desirable.

A phased changeover amounts to constructing a separate pupil assignment plan for each year of the transition period, which means that careful attention must be given to the balancing of enrollment with capacity in each school in each transition year. All the children must be accommodated every year.

The alternative selected to illustrate time phasing is C-5, which is the plan calling for 3-3-3-3 grade level organization, academic senior high school at the Benjamin Franklin site, and eventual closing of Polytechnic Senior High School. This alternative--posing many relatively complex problems--was chosen because it exemplifies the nature of the changeover and provides a valid demonstration of the feasibility of the 4-year transitional period.

General Guidelines

In constructing a phasing plan the following general guidelines have been observed:

1. By the beginning of Year 4 the plan should be fully implemented. If Year 1 is the school year 1968-9, then Year 4 would be the school year 1971-2. For this timing, the new attendance policy would have to be adopted in 1967-8 and capital funds be made available in 1968-9.

2. Changes in the first part of the transition period should be moderate so that administrators and other participants can gain experience in making the many adjustments required.

3. Students should have as much continuity as possible in school attendance and should not have to make multiple moves during the transition period.

4. Whenever possible, students entering the last grade in a cycle (e.g., grades 6, 9, and 12) should be permitted to graduate from the school they have been attending.

5. Stages should be planned to coincide with the availability of new school capacities; for example, the Potrero and Visitacion Valley Junior High Schools and the Diamond Heights Senior High School.

6. The B and C plans employ cycles of three grades. The logic of making a changeover from 6-year elementary schools to a 3-3-3-3 pattern in two years is shown in Table 8. Here, two hypothetical elementary schools, A and B, each with 420-student capacity, are converted to a primary school (K-3) and an intermediate school (K, 4-6), respectively. The year before conversion is Year 0. Conversion is complete at the beginning of Year 2.

Table 8

TRANSITIONAL PATTERN CONVERSION OF TWO K-6 SCHOOLS TO K, 1-3 SCHOOL AND K, 4-6 SCHOOL

	Enrollment					
	School A			School B		
	Year			Year		
Grade	0	1	2	0	1	2
K	60	60	60	60	60	60
1	60	120	120	60	--	--
2	60	120	120	60	--	--
3	60	60	120	60	60	--
4	60	--	--	60	120	120
5	60	--	--	60	120	120
6	60	60	--	60	60	120
Total	420	420	420	420	420	420

Note: Arrows indicate directions of moves.

The foregoing pattern of a two-year conversion works in the same manner for the secondary schools. For a junior high school in the first year, the graduating class of ninth graders are those who have been attending the school before changeover. But in Year 1 the entering classes of seventh and eighth graders are drawn from the new attendance zone. Then in Year 2 the school is fully converted to the new attendance policy.

Overview of C-5 Phasing

The proposed transition for the entire city would require four years. It would start in the part of San Francisco where the changes largely are self-contained; i.e., where interneighborhood transportation of students is minimal. Also, the beginning phase would be in an area relatively unaffected by construction authorized by the 1964 bond issue.

The Balboa High School area in the southcentral part of San Francisco best meets the criteria. For this area, it is proposed in Year 1 that the first two grades in a cycle adopt the proposed new attendance policies. In the first year, graduating grades in each cycle would adhere to the old, or existing, attendance policies. In this way, the new patterns of grade level organization and of attendance can be started on a modest basis so that experience can be gained in making a smooth transition.

Where some interneighborhood transportation of students is part of the ultimate plan, the phasing that has been designed would call for relatively little such transportation in Year 1, more in Year 2, and total implementation of the plan by Year 4.

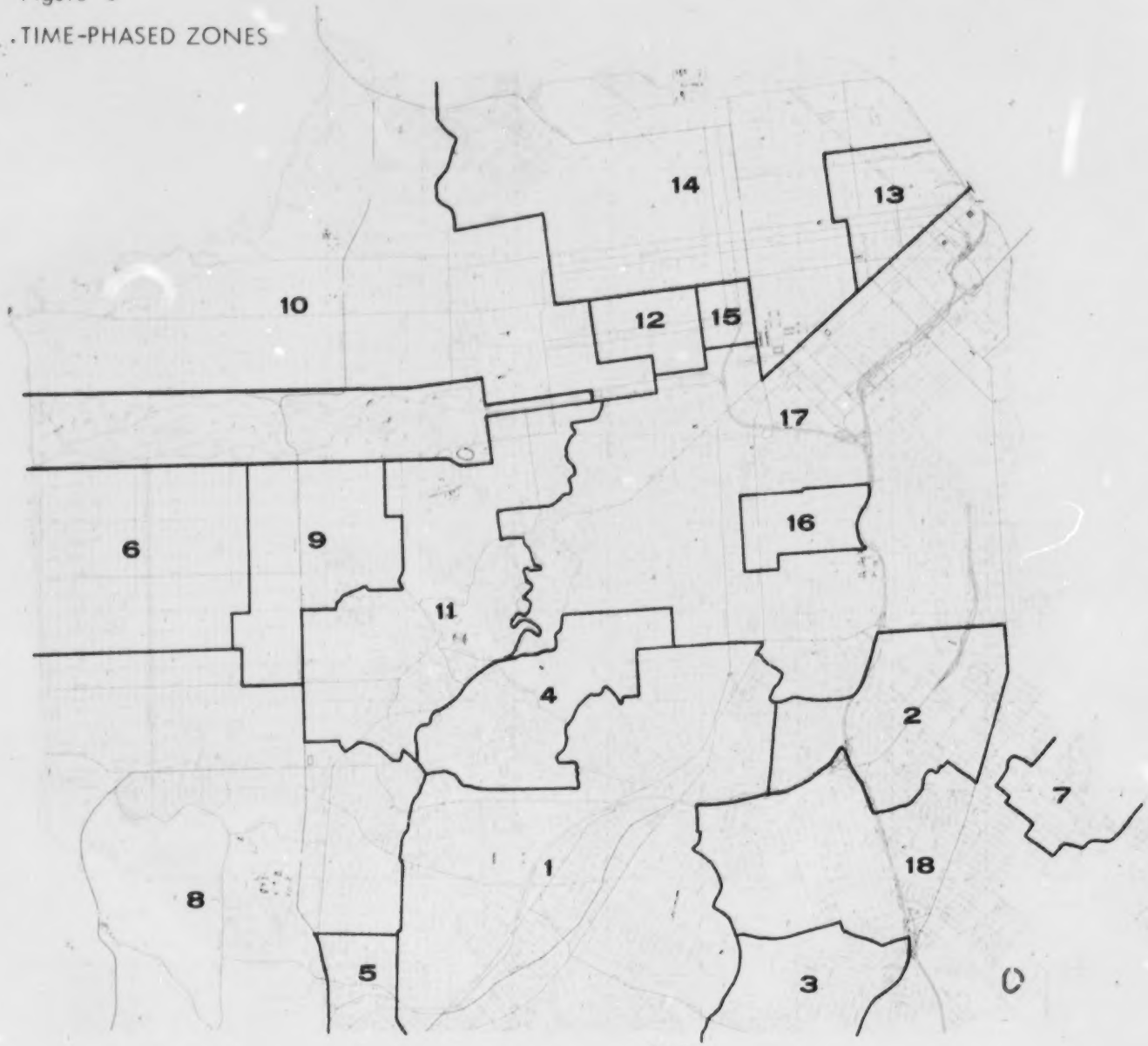
The implementation proceeds from the southcentral part of the city on around, more or less in a clockwise movement, to other areas of the city. One reason for leaving parts of southeast San Francisco to last is the time needed for the completion of Visitacion Valley Junior High School and Potrero Junior High School.

Diamond Heights Senior High School will not be available until 1971. One year is gained in implementing the attendance plan by substituting Polytechnic Senior High School for Diamond Heights Senior High School in Year 3. Then when Diamond Heights Senior High School becomes available, the student body can substitute Diamond Heights for Polytechnic, since Polytechnic High School is planned for eventual phase-out under the alternative being considered.

Figure 8 shows 18 zones covering all of San Francisco. Each zone has a slightly different set of rules for its scheduled implementation

Figure 8

TIME-PHASED ZONES



over the 4-year period. The specific status of each grade level in each of the 18 zones is given in Table 9. Working Paper No. 2 presents a detailed statement of the specific steps.

The time-phased requirements for busing and for facility modifications are discussed in the next two chapters.

Table 9

TIME PHASING FOR ALTERNATIVE C-5

	Zone	Grades 1,2	4,5	7,8	10,11	3	6	9	12
Year 1 (1968)	1	C-5	C-5	C-5	C-5	Old†	Old	Old	Old
	2	C-5	C-5	C-5	Old	Old	Old	Old	Old
	3	Old	Old	Portola	C-5	Old	Old	Old	C-5
	4	C-5	C-5	C-5	Mission	Old	Old	Old	Old
	5	Old	Old	C-5	Old	Old	Old	Old	Old
	6	C-5	C-5	Old	Old	Old	Old	Old	Old
	7	C-5*	Old	Old	Old	Old	Old	Old	Old
Year 2 (1969)	1	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5
	2	C-5	C-5	C-5	Mission	C-5	C-5	C-5	Old
	3	C-5	C-5	Portola	C-5	Old	Old	Portola	C-5
	4	C-5	C-5	C-5	Mission	C-5	C-5	C-5	Mission
	5	Old	Old	C-5	Old	Old	Old	C-5	Old
	6	C-5	C-5	Old	Old	C-5	C-5	Old	Old
	7	C-5 all	Old	Old	Old	C-5	Old	Old	Old
	10	C-5	C-5	C-5	C-5	Old	Old	Old	Old
Year 3 (1970)	1	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5
	2	C-5	C-5	C-5	Mission	C-5	C-5	C-5	Old
	3	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5
	4	C-5	C-5	C-5	C-5 to Poly	C-5	C-5	C-5	Mission
	5	C-5	Old	C-5	Old	Old	Old	C-5	Old
	6	C-5	C-5	Old	Old	C-5	C-5	Old	Old
	7	C-5	C-5	C-5	Old	C-5	Old	Old	Old
	8	C-5	C-5	C-5	Old	Old	Old	Old	Old
	9	C-5	C-5	Old	Old	Old	Old	Old	Old
	10	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5
	11	C-5	C-5	C-5	C-5 to Poly	C-5	C-5	Old	Old
	12	C-5	C-5	C-5	Old	Old	Old	C-5	Old
	13	C-5	C-5	C-5	C-5 to Poly	Old	Old	Old	Old
	14	C-5	C-5	C-5	Old	Old	Old	C-5	Old
	15	C-5	C-5	C-5	C-5	Old	Old	Old	Old
	16	Old	Old	C-5	Old	Old	Old	C-5	Old
	17	C-5	C-5	C-5	C-5	Old	Old	Old	Old
	18	C-5	C-5	C-5	C-5	C-5	C-5	C-5	C-5

* 2/3 of 500 students, Hunters Point I and II and Annex.
† Old = 1966 attendance rules.

ANALYSIS OF TRANSPORTATION REQUIREMENTS

The analysis of the costs for transporting students to achieve racial balance in the SFUSD was presented in Research Memorandum No. 6. Origin and destination figures were generated for an alternative C-5 base case to represent the required movement from school to school. The cost elements for a district-owned bus fleet were then analyzed. These costs were combined with the movement data to develop the system costs for a district-owned and operated school bus system. The costs were derived in such a manner that they could be extrapolated to other levels of student movement.

The transporting or busing figures reported for the study reflect the numbers of students who would have to be moved among neighborhoods to achieve the designed attendance patterns. An exception to this general measure relates to the academic senior high school: in no case is transportation of students attending that school added to the transportation load figured for busing. It is current policy for the district not to bus senior high school students; only limited busing of junior high school students exists now. Secondary students are included in the transportation costs in this study, however, because of the significantly increased distances and numbers of students involved in interneighborhood movements.

The costs developed in Research Memorandum No. 6 were preliminary in the sense that they were estimates rather than actual bids for equipments, facilities, and services. When, and if, a specific plan is selected by the district, definite bids can be obtained. The estimated costs presented here and later in the cost-effectiveness chapter are considered sufficiently accurate to allow the district to assess the relative costs of the alternatives evaluated and to approximate the total expenditures required to achieve various levels of racial balance.

School Bus Requirements

The bus operations were established for the C-5 base case by analyzing the flow patterns representing the required movements of children from school to school. The C-5 alternative calls for 9,620 children to be transported when the plan is fully implemented.

The size of the bus fleet required was determined by assigning buses to the flow patterns. Constraints of school hours and bus sizes were observed, as were transit times and distances. Table 10 shows the number of buses and daily route miles for three bus sizes for the C-5 alternative.

Table 10

BUSES AND ROUTE MILES

Seats/Bus	Total Buses	Daily Route Miles
67	87	3,460
79	68	2,757
91	62	1,579

The analysis included requirements for spare buses and the deadhead distances between schools and to and from terminals.

Analysis of Costs

Two basic costs are involved in district-owned school bus systems: capital and operating costs. Capital costs include buses, parking areas, and administrative and maintenance facilities. Operating costs include administrative staff salaries, wages for maintenance and operating crews, insurance, and fuel, parts, oil, and grease for the buses.

Costs were developed for several operating systems. For example, a bus fleet may be composed of conventional school buses with lower initial costs but higher operating costs, or the fleet may use transit-type school buses having higher initial costs but lower operating costs. System descriptions were developed for the base case for several bus sizes in terms of the required facilities, personnel, and equipment. In the system description, cost schedules were developed to show capital and operating costs. Ratios were then developed to show the projected cost per student transported of a hypothetical district-owned bus system.

An independent estimate was made by the Muni (San Francisco Municipal Railway). This estimate is reported in Research Memorandum No. 6. Along with the decision as to which alternative to implement, the district must determine whether to inaugurate a district-owned bus system, contract with Muni, or contract with an independent contractor.

Total transportation costs for the various alternative attendance patterns are presented in Table 11. The table shows the total number of students to be moved, the capital costs for the district-owned system, and the annual operating costs.

Table 11

ESTIMATED TRANSPORTATION COSTS

	B-1	B-3	C-3	C-5	D-2	E-4
Students transported	2,840	6,100	6,410	9,230‡	15,365	6,490
Capital costs* ($000)	$765	$1,493	$1,563	$2,194	$3,566	$1,581
Annual operating costs† ($000)	111	215	225	315	512	228

* Capital costs ($000) = 130 + 0.2236 (number of students).

† Annual operating costs ($000) = 20 + 0.032 (number of students).

‡ Research Memorandum No. 6 calculated busing costs on the basis of 9,620 students. Later refinement of the C-5 alternative pattern reduced the number to 9,230.

Intraneighborhood Transportation

In addition to interneighborhood transportation, most alternative attendance patterns require a considerable increase in the intraneighborhood distances. This increase is particularly true for the C and D patterns, which pair elementary schools at 1-3 and 4-6 levels--normally doubling the attendance area for each school. It was assumed the district will provide transportation for students living beyond one mile for elementary and beyond 1-1/2 miles for junior and senior high school students.

To estimate the magnitude of the increased intraneighborhood transportation requirements, a map analysis was conducted on the basis of the 1965 attendance areas and school populations, compared with the 1971 projected school attendance areas of the C-5 pattern. Attendance areas lying beyond the designated radius for any school were indicated on a map. The number of students in census tracts falling outside that radius was estimated. Table 12 presents the estimated counts for 1965 and the 1971 C-5 pattern.

Table 12

ESTIMATED INTRANEIGHBORHOOD TRANSPORTATION, BY SCHOOL ATTENDANCE AREA
1965 Actual and 1971 C-5 Pattern
(Number of Students)

	1965			C-5			
School	1-6	Junior High	Senior High	1-3	4-6	Junior High	Senior High
A. Lincoln			630				530
A. P. Giannini						600	
F. S. Key					90		
Lawton				110			
Balboa							230
L. Burbank						280	
Glen Park					70		
Longfellow					120		
Monroe				120			
Diamond Heights							300
H. Hoover		650				400	
West Portal					180		
Clarendon				220			
Miraloma					90		
Galileo			740				110
Francisco		40					
Marina		630				50	
Yerba Buena				10			
Sherman					20		
G. Washington			1,090				760
Cabrillo					170		
F. McCoppin				80			
Aptos		120				300	
Commodore Sloat					210		
Lakeshore				90			
New Ulloa				70			
Mission			2,060				320
Potrero						230	
B. Carmichael					30		
Everett		660					
Sanchez					60		
Total	0	2,100	4,520	700	1,040	1,860	2,250

Several factors should be considered in the interpretation of the intraneighborhood data. First, the students bused to other neighborhoods are excluded from both the 1965 and 1971 data. This reduction in the students available affects the C-5 pattern more severely for intraneighborhood movements and at least partially explains the decrease in junior high school and senior high school movements. Second, school facilities in 1971 are slightly more numerous and evenly distributed geographically--Diamond Heights and the Benjamin Franklin academic Senior High Schools are added, while Polytechnic is phased out, and Potrero and Visitacion Valley Junior High Schools are added, while Horace Mann and Benjamin Franklin Junior High Schools are converted to other uses. These cases are few, but they do affect the marginal distances, which is particularly true of Everett Junior High School, which had almost one-third the total junior high school intraneighborhood movement in 1965.

The 1,740 elementary school children are additive movements over the 1965 pattern, when no children were more than one mile from their neighborhood elementary schools. Further, it should be recognized (as district administrative personnel pointed out) that, on implementation of a plan such as the C-5 pattern, other students would be subject to difficult intraneighborhood movements because of the local terrain. For example, the pairing of Miraloma and Diamond Heights Elementary Schools would require children to walk across Glen Canyon Park Valley and O'Shaughnessy Boulevard. To the extent possible, such difficult movement was avoided in designing the attendance areas.

SCHOOL FACILITY MODIFICATIONS

The alternative attendance patterns were devised to adhere as closely as possible to present and planned school capacities. Table 13 shows the estimated total number of students and total school capacity for 1971. The table shows that the gross capacity exceeds the number of students at all school levels, but that little excess capacity exists at the high school level in the 6-3-3 plans and very little excess at kindergarten level in the 4-4-4 plan. If the capacity of any one school always matched the number of students assigned to it, there would be no problems of over-capacity. However, if the school district wishes to increase racial balance by one-way busing out of low socioeconomic areas, an imbalance in capacity is immediately created at senior high school level. As will be seen later, senior high school additions are the major element of facility cost for all alternatives.

The 4-4-4 (E-4) capacity figures in Table 13 are obtained on the basis of the balance available at each level after closing a number of elementary schools and converting others to middle schools. The apparent small excess kindergarten capacity in the 4-4-4 plan is the result of using only the same kindergarten capacities by school as were used in the 6-3-3 plan. Under the E-4 patterns these same schools would have excess capacity at the 1-4 level, which could be used to correct kindergarten deficits.

Meeting Capacity Imbalances

Because of imbalances in capacity in the various alternatives, each attendance pattern requires that some additional space be provided at existing schools. Several require fairly major realignment of facilities. Table 14 shows for the major alternatives the number of students and classrooms in schools that are more than 10 percent* over capacity. It also includes the number of classrooms required for new schools.

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* In 1966 several schools housed more students than their rated capacities. The maximum overload went as high as 24 percent.

Table 13

ESTIMATED TOTAL SCHOOL CAPACITY VS ENROLLMENT--SFUSD
1971

	Capacity						
	1965	Temporary	Bond Issue (1966-71)	Total		Enrollment	Balance
6-3-3							
Kindergarten	52,690*	1,935	2,430	57,055	9,355	7,944	1,411
Grades 1-6					47,700	39,552	8,148
Junior high	20,420	600	2,000	23,020		19,438	3,582
Senior high	17,997	986	2,500	21,483		20,576	907
						87,510	
4-4-4							
Kindergarten				42,325	8,245	7,944	301
Grades 1-4					34,080	26,585	7,495
Middle schools				27,170		25,917	1,253
High schools				29,585†		27,057	2,528
						87,503	

* Twin Peaks Annex and old Golden Gate are omitted.
† Includes Benjamin Franklin Academic at 2,700.

Table 14

SCHOOLS TEN PERCENT OVER CAPACITY AND NEW SCHOOLS REQUIRED
(Number of Students and Numb[illegible] of Classrooms)*

	A-1	B-1	B-3	C-3	C-5	D-1	D-2	E-4
Elementary								
Students	350	110	210	1,480	2,040	340	1,720	0
Classrooms	11	4	7	49	68	11	57	0
Junior high								
Students	--	0	0	0	340	--	450	3,130
Classrooms	--	0	0	0	11	--	15	104
Senior high								
Students	--	830	790	790	1,000	--	1,000	1,700
Classrooms	--	28	26	26	33	--	33	57
Total, all levels								
Students	350	940	1,000	2,270	3,380	340	3,170	4,830
Classrooms	11	32	33	75	112	11	105	161

* Computed at 30 students per classroom at individual schools.

The most extensive requirements at the elementary level are in the C-5 plan, which is explained in some detail later in this chapter. Both the C-3 and D-2 plans also require more space than do other plans at elementary school level because of the necessity to pair schools of unequal capacities. With few exceptions, however, this increase can be accommodated by adding between one and five bungalows* to any one site.

Those elementary schools that require more than a five-classroom addition and the additional new elementary school that is required for the C-5 and D-2 plans are shown below (in numbers of students).

	C-3	C-5	D-1	D-2
Douglas			220	
Fremont		290		290
Mark Twain	470	420		420
New Ulloa		270		270
Total	470	980	220	980

It is assumed that new construction would be required in all these cases. These figures have been converted to number of new classrooms needed and subtracted from the number of classrooms required for each alternative in Table 15. The excess bungalows are then compared with the number of bungalows required for each plan.

Table 15

ELEMENTARY BUNGALOW REQUIREMENTS

	A-1	B-1	B-3	C-3	C-5	D-1	D-2	E-4
Total classrooms required	11	4	7	49	68	11	57	0
New construction required	0	0	0	15	33	7	33	0
Bungalows required	11	4	7	34	35	4	24	0
Bungalow excess	33	37	37	34	34	33	38	46
Net bungalows required	(22)	(33)	(30)	0	1	(29)	(12)	(46)

* Bungalows are the district's equivalent of relocatable classrooms. They are semipermanent.

As the table indicates, only in the C-5 plan is there a shortage of bungalows--and by only one. Two small bungalows could be used to fill this requirement. (Small bungalows are not included in the bungalow figures.)

Reconciliation with 1964 Bond Construction Program

The 1964 bond construction program calls for a number of additions and replacements to elementary schools. Most of SRI's proposed alternative plans do not use this added capacity to its full extent. If the construction program could be modified to reduce the number of new spaces at some schools and to add on at others, the new construction program at elementary level would resemble that shown in Table 16. It shows that only the C-5 and D-2 plans require additional new construction.

The 1964 bond program also calls for new construction at the junior high and senior high levels. These schools, in contrast to the elementary school program, are all completely new--Potrero and Visitacion Valley Junior Highs and Diamond Heights Senior High School. New capacities are assumed in this report to be 1,000 each in the junior highs and 2,500 at Diamond Heights. Using these figures, the study team estimated excess classrooms, together with estimated classrooms needed at other sites (Table 17). Comparative costs of different plans are summarized later in this chapter.

Modifications for C-5 Attendance Pattern

The C-5 alternative--phasing out Polytechnic Senior High School and modifying the Benjamin Franklin site to become the city's academic senior high school--is representative of the types of changes in school facilities required to achieve a significant level of racial balance in the district.

Table 18 lists the schools in the C-5 pattern that are more than 10 percent over their rated capacity. A maximum of 3,380 additional spaces are needed at all school levels, or 112 new classrooms.

The elementary school requirement is for 68 additional classrooms, or about 60 percent of the total space required. In all but three schools, the use of bungalows can accommodate this requirement. A new facility is called for at the 38th Avenue and Ulloa Street property already owned by the district. It would serve as a small (9 classrooms) 1-3 school to be

Table 16

NEW CLASSROOM CONSTRUCTION REQUIREMENTS
Elementary Level

	A-1	B-1	B-3	C-3	C-5	D-1	D-2	E-4
Excess new capacity*								
Bret Harte	14	6	6	9	9	8	4	4
Buena Vista	0	0	0	0	0	0	0	0
Burnett	0	11	11	11	7	11	5	6
Cabrillo	0	2	2	0	0	0	0	0
El Dorado	0	4	4	4	0	0	0	0
Grattan	0	2	2	0	0	0	0	4
Total excess	14	25	25	24	16	19	9	14
New capacity required								
Total	0	0	0	15	33	7	33	0
Balance required	(14)	(25)	(25)	(9)	17	(12)	24	(14)

* From the 1964 Bond Issue Program.

Table 17

NEW CLASSROOM CONSTRUCTION REQUIREMENTS
Junior High and Senior High

	B-1	B-3	C-3	C-5	D-2	E-4
Excess new capacity						
Potrero Junior High	8	8	8	0	0	0
Visitacion Valley Junior High	1	1	1	1	0	0
Diamond Heights High School	11	8	8	5	11	0
Total excess	20	17	17	6	11	0
Capacity required						
Giannini				11	11	
Herbert Hoover						14
Horace Mann						5
Potrero						8
New Presidio						67
Visitacion Valley					4	10
Abraham Lincoln	16	17	17			
Benjamin Franklin				33	33	57
Mission	12	9	9			
Total required	28	26	26	44	48	161
Balance required	8	9	9	38	37	161

Table 18

MAXIMUM ADDITIONAL FACILITIES REQUIRED FOR C-5 ALTERNATIVE

Schools	Students	Classrooms
Elementaries		
New Ulloa	270	9
Cabrillo	60	2
Candlestick	90	3
Clarendon	70	2
Columbus	30	1
Diamond Heights	60	2
El Dorado	110	4
Fremont	290	10
Geary	60	2
Grattan	120	4
Hancock	50	2
J. McLaren	100	3
LeConte	60	2
Mark Twain	420	14
Miraloma	120	4
P. A. Hearst	60	2
R. L. Stevenson	70	2
Subtotal	2,040	68
Junior highs		
Giannini	340	11
Senior highs		
B. Franklin	1,000	33
Total	3,380	112

paired with P. A. Hearst Elementary School. Two additional elementary schools will require major additions of capacity--Fremont (with 10 classrooms) and Mark Twain (with 14 classrooms).

At secondary school level, 44 additional classrooms would be required. A. P. Giannini Junior High School would have to be increased by 11 classrooms. There is sufficient space at the school site for expansion either by adding bungalows along the south end of the property or by new school construction.

The conversion of the current Benjamin Franklin Junior High School to become the academic senior high school would require a major construction program. Specific modifications were not developed in this study. The rated capacity of Benjamin Franklin as a junior high school at 1,000 students was used as the basis for estimated additions. It appears feasible to acquire property south of the current site for expansion. Also, proximity to the new library across Geary Street and the large Hamilton playground area are desirable supplements to the academic senior high school. Its more central location than that of Lowell should be a considerable advantage over the present arrangement.

The plan further envisions converting Horace Mann Junior High School to a senior high school. Its administration could be combined with that of the John O'Connell Trade and Industrial School and possibly with the Samuel Gompers school facility to form a major technical senior high school complex. Acquisition of the property adjacent to Horace Mann and Samuel Gompers in the two-block area between 22nd and 24th Streets would provide sufficient space for a desirable senior high school campus. This site is well-located--close to the planned BART station on 23rd Street and adjacent to other city services. Implementation of the other elements of the C-5 pattern, however, is not dependent on this configuration.

Polytechnic Senior High School could be phased out in 1971 according to this plan. Also, the capacity of the following elementary schools and annexes would not be required:

Sir Francis Drake	Sir Francis Drake Annex
Jed Smith	Jed Smith Annex
Hunters Point I	Hunters Point Annex
Hunters Point II	Sutro Annex
I. M. Scott	Visitacion Valley Annex

These schools could be used either for preschool and kindergarten purposes or could be phased out.

Revised Elementary School Grade Levels

Since a significant portion of the excess capacity required at the elementary level results from the pairing of schools of unequal capacities, partial compensation could be achieved by adopting a 1-4 and 5-6 grade level pattern for seven groups of schools. These revisions are presented in Table 19, which also shows the numbers of students affected by the change and the reduced classroom requirements. The revised grade level arrangement probably would not affect the educational advantages of the two-level elementary school system nor the estimated increased racial balance for these 17 schools. The 24 additional classrooms required for these schools in the original C-5 case are reduced to 7 by this variation in grade structure.

The net effect of the revised grade level arrangement would be to reduce the requirement for added elementary classrooms from 68 to 51. Significantly, the added space requirement at Fremont Elementary School would be reduced from 10 to 5 added classrooms, which could probably be accommodated by bungalow space.

1964 Bond Issue Construction

The C-5 alternative does not contemplate using the full capacity of the new construction programs at Bret Harte and Burnett Elementary Schools. Because the projected 1971 enrollment at Bret Harte is 480 students and Burnett 500 students (excluding kindergarten enrollees), present capacity appears sufficient. Should the C-5 plan be adopted, the planned 20- to 24-classroom additions could help meet the requirements at the Mark Twain and new Ulloa Street sites.

The planned modification construction at Cabrillo, El Dorado, Grattan, Paul Revere, and Buena Vista Elementary Schools is incorporated in the plan and is used to capacity. The projected attendance at Visitacion Valley and Potrero Junior High Schools is 970 and 1,100 students, respectively. It is considered that the planned schools could accommodate this attendance. Enrollment at Diamond Heights Senior High School is projected to be about 2,350 students. This figure is below the capacity estimate of 2,500 used for this report, but somewhat above the district's currently planned capacity of 2,000. Thus some addition to Diamond Heights Senior High School may be necessary.

Table 19

C-5 ALTERNATIVE SCHOOL CAPACITY REVISED, BY 1-4 AND 5-6 GRADE LEVEL SCHOOLS
(Number of Students and Classrooms)

School	C-5				C-5 Revised			Revised Classroom Requirements
	Capacity	1-3	4-6	Variation	1-4	5-6	Variation	
Columbus	300		332	+30		266	w.l.	
Jefferson	480	332		w.l.	398		w.l.	
J. McLaren	690		792	+100		634	w.l.	
Guadalupe	480	396		w.l.	475		w.l.	
Cleveland	420	396		w.l.	475		+55	2
Grattan	570		693	+120		554	w.l.	
Dudley Stone	750	453		-300	542		-210	
Laguna Honda	420	240		-180	290		-130	
Clarendon	450		522	+70		420	w.l.	
West Portal	600	523		w.l.	625		w.l.	
Hancock	390		436	+50		348	w.l.	
Garfield	390	218		-170	262		-130	
S. B. Cooper	330	218		-110	262		w.l.	
Geary	240		297	+60		237	w.l.	
Madison	420	297		-120	357		w.l.	
Fremont	360		650	+290		520	+160	5
P. Revere	885	650		-230	780		-130	

Note: w.l. = within limits of the variation.

Summary of Facility Requirements

Table 20 presents a summary of modifications to facilities assuming that the C-5 attendance patterns and the changes in the new construction program could be effected. Land acquisition for the Benjamin Franklin and the Horace Mann conversions would be required, as would new construction at A. P. Giannini Junior High School and Benjamin Franklin High School. It is also likely that modest land acquisition will be required in adding rooms to the following elementary schools: Candlestick Cove, El Dorado, LeConte, Mark Twain, and Miraloma.

Table 20

SUMMARY OF FACILITY MODIFICATIONS
ALTERNATIVE C-5

Schools	Modifications
Elementary	
New Ulloa	9-classroom school--1964 construction plan modification
Cabrillo	Transfer in 2 bungalows over 1964 construction plan
Candlestick	Transfer in 3 bungalows
Cleveland	Transfer in 2 bungalows
Diamond Heights	Transfer in 2 bungalows
El Dorado	Transfer in 4 bungalows
Fremont	Transfer in 5 bungalows
LeConte	Transfer in 2 bungalows
Mark Twain	Add 14 classrooms--1964 construction plan modification
Miraloma	Transfer in 4 bungalows
P. A. Hearst	Transfer in 2 bungalows
R. L. Stevenson	Transfer in 2 bungalows
Junior high	
Giannini	Add 11 classrooms (or bungalows)
Senior high	
Benjamin Franklin	Acquire land, construct 33 new classrooms

Time-Phased Implementation Plan

An earlier section of this report outlined a preliminary time-phasing plan for implementing the C-5 alternative. Table 21 reduces the summary facility requirements to a four-year schedule. During the first year the construction schedule is timed so as to require moving only 15 bungalows and to continue the currently scheduled construction programs. Year 2 requires the movement of five more bungalows and initiates construction for the new Ulloa school and the additions to Mark Twain and A. P. Giannini. Completion of major changes are visualized by Year 3, as well as completion of the new Visitacion Valley and Potrero Junior High Schools, the new Ulloa Elementary School, and the additions to A. P. Giannini and Mark Twain. Also, at this time, the elementary bungalows will be moved. Construction will begin on the new classrooms at Benjamin Franklin. By Year 4 all facilities will be complete. Therefore, should the plan be adopted in the school year 1967-8, to begin in the fall of 1968, it could be completed by the fall of 1971. Capital funds would have to be available in 1968.

Cost Factors and Comparisons

Estimated costs for additional capacity were taken from material (Table 22) available from the district on the estimated costs of construction for the 1964 bond issue construction program. Costs per classroom were estimated at $50,000 for elementary schools and $80,000 for junior and senior high schools. Also, the cost to move and relocate a bungalow is estimated at $10,000. These figures were used to estimate the facility modification cost for the C-5 attendance pattern. Additional costs would be required for land acquisition mentioned earlier. Table 23 presents the breakdown of the estimated additional costs of $4.15 million for the modified C-5 plan by year of implementation. Funding and partial construction payments would have to precede payment of the implementation costs by appropriate lead times.

Comparison of Facility Costs for the Alternative Patterns

To estimate the relative costs of the alternative plans, costs from the modified C-5 pattern were converted to estimated cost per additional student space required for the total plan. It is assumed that the number of classrooms over capacity for C-3 and D-2 plans (paired 1-3 and 4-6 schools) could be reduced to the same degree that the C-5 classrooms were reduced by specific adjustments. The costs per added classroom were then applied to the requirements for the other attendance alternatives. Table 24 presents these data. Land acquisition and internal school modification costs are not included.

Table 21

TIME-PHASED FACILITY MODIFICATION PLAN
C-5 ALTERNATIVE

Year 1	Year 2	Year 3	Year 4
Cleveland - 2 bungalows Fremont - 5 bungalows Miraloma - 4 bungalows R. L. Stevenson - 2 bungalows Paul Revere - addition complete Diamond Heights Elementary - construction complete plus 2 bungalows			
El Dorado - addition begun	El Dorado - addition complete plus 4 bungalows		
Cabrillo - replacement begun	Cabrillo - replacement complete plus 2 bungalows		
Grattan - replacement begun	Grattan - replace complete		
Buena Vista - replacement begun	Buena Vista - replacement complete		
Visitacion Valley Junior High - construction begun		Visitacion Valley Junior High - construction complete	
Potrero Junior High - construction begun		Potrero Junior High - construction complete	
Diamond Heights High School - construction begun			Diamond Heights High School - construction complete
	Mark Twain - addition begun	Mark Twain - 11 classrooms added	Mark Twain - 3 classrooms added
	Giannini Junior High - addition begun	Giannini Junior High - 11 classrooms added	
	New Ulloa - Construction begun	New Ulloa - 9 classrooms added	
		Candlestick - 3 bungalows	
		P. A. Hearst - 2 bungalows	
		LeConte - 2 bungalows	
		B. Franklin High School - construction begun	B. Franklin High School - 33 classrooms added

Table 22

ESTIMATED CONSTRUCTION COSTS--SFUSD*

School	Modification	Students	Classrooms	Thousands of Dollars Total Cost	Cost/ Classroom	Cost/ Student
Elementary						
Bret Harte	Addition	330†	10-12	$ 440	$40	$
Burnett	Addition	330†	10-12	550	50	
Cabrillo	Replacement	630†	20-22	1,104	53	
Diamond Heights	New	600†	20	960	48	
El Dorado	Addition	300†	10	536	54	
Grattan	Replacement	630†	20-22	1,104	53	
P. Revere	Addition	360†	12	648	54	
Buena Vista	Replacement	480†	16	850	53	
Total		3,660	122	$6,192	$51	$1,700
Secondary						
Diamond Heights Senior High School	New	2,000	67†	5,040	75	
Potrero Junior High School	New	900	30†	2,640	88	
Visitacion Valley Junior High School	New	900	30†	2,640	88	
Total		3,800	127	$10,320	$81	$2,700

* From 1964 Bond Issue Contruction Program.
† Estimated at 30 students per classroom.

Table 23

FACILITY MODIFICATION COSTS FOR C-5 PATTERN
BY YEAR OF IMPLEMENTATION
(Thousands of Dollars)

Cost Element	Year 1	2	3	4	Total
Move bungalows	$150	$ 60	$ 70	$ --	$ 280
Elementary construction	--	575	575	--	1,150
Junior high school construction	--	440	440	--	880
High school construction	--	--	1,320*	1,320*	2,640*
Gross total funds	$150	$1,075	$2,405*	$1,320*	$4,950*
1964 bond fund transfer	--	400	400	--	800
Net total funds	$150	$ 675	$2,005*	$1,320*	$4,150*

* Plus land acquisition costs.

These preliminary estimates of facility costs are probably sufficient to establish the relative costs of the alternatives presented. These estimates are not sufficient for funding purposes and should be refined in detail when the district has selected an alternative for implementation.

Table 24

ESTIMATED FACILITY COSTS FOR ALTERNATIVE ATTENDANCE PATTERNS

	Thousands of Dollars					
	B-1	B-3	C-3	C-5	D-2	E-4
Preliminary estimates						
Bungalows*	$ 4	$ 7	$ 34	$ 35	$ 24	$ 0
Elementary classrooms†	0	0	0	17	24	0
Secondary classrooms‡	28	26	26	44	48	161
Adjusted estimates						
Bungalows moved§	3	5	27	28	19	0
Elementary classrooms**	0	0	0	7	10	0
Secondary classrooms	28	26	26	44	48	161
Total costs						
Bungalows moved††	30	50	270	280	190	0
Elementary classrooms‡‡	0	0	0	350	500	0
Secondary classrooms§§	2,240	2,080	2,080	3,520	3,840	12,880
	$2,270	$2,130	$2,350	$4,150	$4,530	$12,880

* See Table 3.
† See Table 4.
‡ See Table 5.
§ C-3, C-5, and D-2 are reduced to 78% as C-5 by use of 1-4, 5-6 schools.
** C-5 and D-2 are reduced to 41% as C-5 by use of 1-4, 5-6 schools.
†† At $10,000 per bungalow moved.
‡‡ At $50,000 per added elementary classroom.
§§ At $80,000 per added secondary classroom.

COST-EFFECTIVENESS ANALYSIS

A major objective of this study is to compare effectiveness of alternative attendance patterns with the corresponding costs of transportation and facility modifications. This chapter presents data on costs and related racial balance indexes.

Cost and Racial Balance Data

The cost data for the busing and added facilities for the alternative patterns is summarized in Table 25. Total capital costs range from a little over three million dollars for the B-1 alternative (the present system with revised boundaries and busing at secondary level) to almost 15 million dollars for the E-4 alternative (the 4-4-4 pattern; Benjamin Franklin as the academic senior high school with one-way busing). The operating costs for the system are for busing only and range from $100,000 per year for the B-1 pattern to $500,000 for the D-2 pattern (3-3-3-3 attendance with cross-busing and Benjamin Franklin as the academic school).

Table 25

COST SUMMARY - -ALTERNATIVE PATTERNS
(Thousands of Dollars)

	B-1	B-3	C-3	C-5	D-2	E-4
Capital costs						
Busing	$ 765	$1,493	$1,563	$2,194	$3,566	$ 1,581
Facilities	2,270	2,130	2,350	4,150	4,530	12,880
Total	$3,035	$3,623	$3,913	$6,344	$8,096	$14,461
Operating costs						
Busing	$ 111	$ 215	$ 225	$ 315	$ 512	$ 228

The composite racial balance indexes--using 1966 as the base value 100--are presented in Table 26 for the quadriracial measure and for the white-nonwhite and Negro-non-Negro indexes. The quadriracial index lies between 18 and 24 percent improvement. This range represents the maximum quadriracial index value, using the constraints of no major facility modifications and no cross-busing. The exception to this range is the improvement of almost 45 percent achieved for the D-2 pattern, which involves the cross-busing of white, Negro, and Oriental students between pairs of 1-3 and 4-6 schools.

Table 26

COMPOSITE RACIAL BALANCE INDEXES
FOR ALTERNATIVE PATTERNS

	B-1	B-3	C-3	C-5	D-2	E-4
Quadriracial	105.3	118.2	122.7	123.1	143.8	120.5
Negro-non-Negro	107.1	136.2	143.8	139.1	169.0	141.5
White-nonwhite	125.7	133.8	137.8	144.9	148.7	142.2

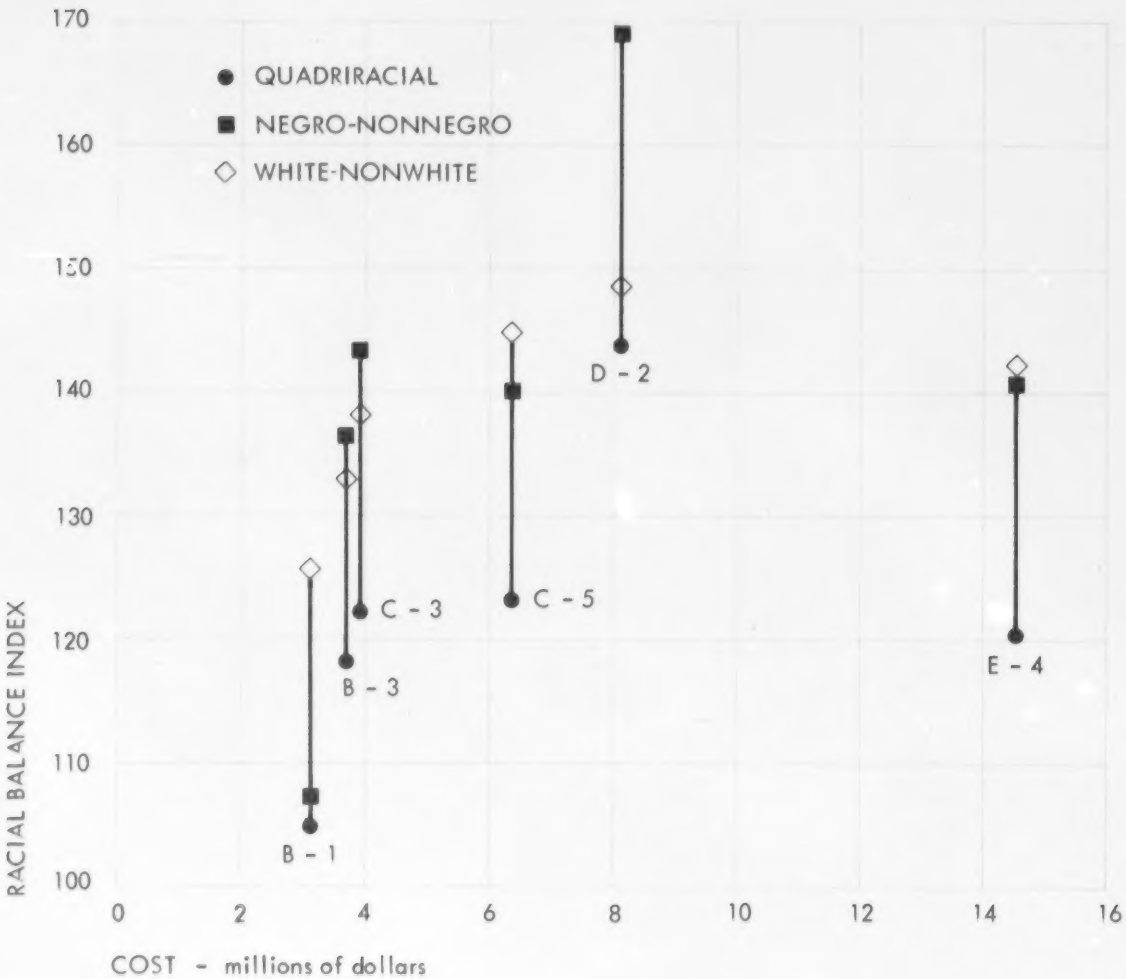
In the derivation of the alternative patterns, priority was given to the balance between the Negro and white races. Table 26 shows that these values are consistently higher than for the quadriracial index, explained by the discouragement felt over the relatively low degree of integration achieved for Oriental and Spanish students. Exceptions to this generalization are the Negro measure for the B-1 pattern and the white measure for the D-2 pattern, which show relatively little improvement. The B-1 pattern requires less busing of Negro children at elementary level than was effected in 1966. The minor difference between the quadriracial and white values for the D-2 pattern results from the fact that it was an extension of the C-5 pattern which had already extensively distributed the white students.

Cost-Effectiveness Comparisons

The relationship of cost and effectiveness for the various patterns is shown in Figure 9 in terms of capital costs, which clearly shows the clustering of the quadriracial effectiveness values between 115 and 120.

Figure 9

CAPITAL COSTS
Cost-Effectiveness of Alternative Patterns



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Also indicated is a crude, but relatively constant, relationship between the increase in quadriracial balance and the increase in capital cost, in the range studied. It appears that each increment of 10 percent of racial balance improvement (by the index selected) adds about $1.3 million in capital costs. The E-4 pattern is an exception to this relationship, which is caused by the high cost of modifying the secondary school facilities to accommodate the added grade level at both middle school and high school levels. Figure 10 presents similar data for the operating costs and racial balance measures for the selected alternatives.

Also indicated in the cost-effectiveness charts are the racial balance measures for the white-nonwhite and Negro-non-Negro indexes for the alternative patterns. In all cases, these values lie above the quadriracial index, indicating the greater degree of integration attained for students of these races, as compared with Spanish and Oriental students.

Figure 10

OPERATING COSTS
Cost-Effectiveness of Alternative Patterns

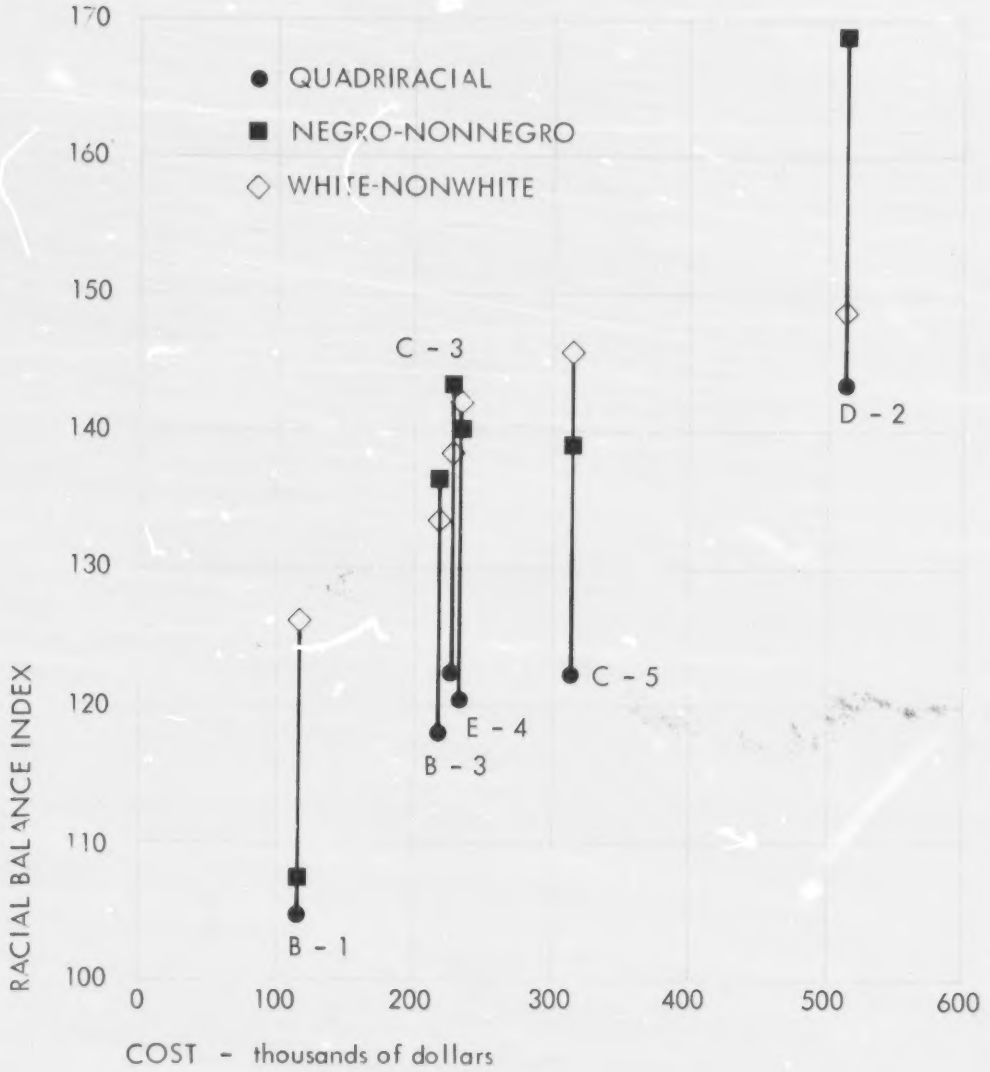

Table 27

ALTERNATIVE ATTENDANCE PATTERNS DEFINED

Alternative	Grade Organization	Academic Senior High School	Students Bused Interzone	
			Elementary	Secondary
A-1	6-3-3	Lowell	0	0
B-1	6-3-3	Lowell	0	2,940
B-2	6-3-3	None	2,270	3,390
B-3	6-3-3	Lowell	2,270	3,830
C-1	3-3-3-3	Lowell	620	2,840
C-2	3-3-3-3	None	2,570	3,390
C-3	3-3-3-3	Lowell	2,770	3,640
C-4	3-3-3-3	B. Franklin	2,570	4,470
C-5 close Polytechnic	3-3-3-3	B. Franklin	2,800	6,430
D-1 pairing	3-3-3-3	Lowell	8,750 (2-way)	--
D-2 pairing	3-3-3-3	B. Franklin	6,930 (2-way)	8,440
E-4	4-4-4	B. Franklin	1,020	5,470